MassGIS DATALAYER DESCRIPTIONS

and a GUIDE TO USER SERVICES

MASS GIS

Massachusetts Geographic Information System

MassGIS
EOEA Data Center
20 Somerset St.
Boston, MA 02108
617-727-3888

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INTRODUCTION

The Massachusetts Executive Office of Environmental Affairs has developed a geographic information system (GIS) for its use in managing the Massachusetts environment. During this effort, EOEA produced a number of digital geographic datalayers of general interest.

EOEA is now able to distribute parts of its growing database to other agencies and groups.
Data can be distributed in a number of ways:

* MassGIS can make **digital copies** of sections of its database.

* MassGIS can make **custom color plots** up to a size of 33" x 46" on its color electrostatic plotter.

* MassGIS can perform **geographic analysis** using the MassGIS database.

* MassGIS will cooperate in **new data development** of mutual interest.

* MassGIS can print **color plots** produced by other groups.

This document is a summary of the contents of a number of the MassGIS datalayers, including a detailed description of data sources, scale, production techniques, and database attributes.
These data were developed using the ARC/INFO GIS software. The MassGIS standard distribution format is data in **ARC/INFO Export**, with data in the Massachusetts State Plane Coordinate System (Mainland Zone). For an additional cost, MassGIS can convert to DXF (Autocad), DIME, DLG, and ASCII, although complete attribute transfer is not always possible. MassGIS can project State Plane Coordinate data into more than 34 other projections.

Also included is a description of the datalayers presently distributed by EOEA. A fee has been instituted to help recover distribution costs.

The Terms and Conditions which apply to the use of data and services can be found at the back of this document. An order form is also attached and can be filled out and sent to MassGIS.

SERVICES AND FEES

The Executive Office of Environmental Affairs is authorized by the Massachusetts Legislature to charge a fee for the digital cartographic data and services it provides to other agencies and the public (Budget Control and Reform Act of 1989 Chapter 653, Section 138). Each product is placed in a price category based on the complexity of the data or service. The charges are meant to recover the cost for labor, materials, and computer processing time expended in fulfilling the data request.

Digital cartographic data files are priced according to the size of the file. A datalayer will be stored as a single statewide coverage if that is an efficient size. Larger datalayers have panel structures that depend on the geographic extent of the data. For example, hydrography and sub-basins are paneled by major drainage basin divides; roads are paneled by quadrangle sheets.

Datalayer paneling & costs:

Data Theme	# of Panels	Panel Unit	Size MBYTE On VAX	Cost $/Panel	Scale
Quad Bounds. (& TICS)	1	State	.085	50	25000
Streams	5	Group Basins	< .65	150	100000
Ponds	5	Group Basins	< .70	150	100000
Town Boundaries	1	State	1.0	100	25000
Maj. Drainage Basins	1	State	.85	100	25000
Drainage Sub-Basins	4	Group Basins	< 1.75	100	25000
Major Roads	1	State	.85	100	100000
Wells	1	State	.18	100	25000
Aquifers	25	Single Basin	< .60	100	48000
Sole Source Aquifers	1	State	< .10	50	25000
Zone IIs (wellhead protection)	1	State	< .60	100	25000
Surficial Geology	3	250k Quads	< 2.0	100	125000
Protected Open Space	6	Group County	< .60	100	25000
Areas of Critical Env.Concern	1	State	< .30	50	25000
Land use	351	Towns	< .60	100	25000
TIGER - One Town	351	Towns	< 1.5	150	100000
TIGER - One County	14	County	very lrg.	150	100000
Roads	189	25k Quads	< 1.75	50	100000
Contours (DLG)	189	25k Quads	< 2.75	100	25000
Elevation (DEM)	189	25k Quads	< .62	50	25000
Elev.30 ft.Contours (250k DEM)	28	Unique Grid	1 - 3+	50	250000
Census (1990 tracts)	2	Half state	1.4	100	100000
Census (1980 tracts)	3	250k Quads	< .55	50	250000
Counties	1	State	.40	50	25000
State Plane Grid 10000 ft.	1	State	1.0	50	25000
RPA Boundaries	1	State	.40	50	25000
Senate Districts	1	State	.50	50	25000
Rail Roads	1	State	.60	50	100000
Pipelines/Trans-lines	1	State	.12	50	100000
Zip Codes	1	State	.30	50	2000000
Aqueducts	1	State	.30	50	100000
Bogs	1	State	0.08	50	100000

There is also a $25 fee per file for converting datalayer panels to DXF, GRASS or any format other than ARC/INFO EXPORT.

Standard map plots made from existing digital files are priced according to the time involved in making the plot. Our color electrostatic plotter makes images as large as 46" x 33.5". Additional copies of the same plot (done at the same time) are $25 each. Add $15 to all prices for plots on clear mylar.

	Paper	**Mylar**
Category A (less that 1 hour)	$ 50	$ 65
Category B (1 - 2 hours)	$100	$115
Category C (over 2 hours)	$150	$165

Custom map and data products can also be created by MassGIS. The complexity of the project will determine the cost.

Category A	$ 250
Category B	$ 500
Category C	$1000
Category D	$2500

Plots from user supplied plotfiles can be plotted by MassGIS. They must be in the Calcomp 1039 Option 6 format or converted to the Precision Images .PPLT format. The price is $50 per plot when written to 1/2 inch tape with the VMS backup command. If more than 25 plots are plotted at the same time, the per plot charge goes down to $25 each. There is an additional $25 charge per tape if the plot file is in Arc/Info export format. Additional copies of the same plot file (done at the same time) are $25 each. Add $25 for each plotfile over 10 megabytes in size.

Contact the MassGIS at (617)727-3888 for more information about these services.

MassGIS
Executive Office of Environmental Affairs
Environmental Data Center
20 Somerset St. - 3rd Floor
Boston, MA 02108

MassGIS Database Updates

One of the most important functions of the MassGIS staff is to keep the database up-to-date and growing. Spatial data changes and new data sources become available over time. The following will describe some recent changes to the core data layers, new additions to the data base and some new initiatives that will result in more digital data during the next year.

Database Changes:

Town Boundaries: The attributes of the TOWNS coverage have been enhanced to include the population numbers from the 1990 Census. Also, several new town-id numbers were added which will allow easier integration with other census statistical data. EOEA has near-term plans to add a 1:25,000 scale coastline to the town boundary coverage as well. Also, MassGIS and the Dept. of Fisheries, Wildlife and Environmental Law Enforcement (DFWELE) are in the process of adding marine community boundaries to this layer.

Public Water Supplies: The DEP Division of Water Supply (DWS) has enhanced the public water supply data layer for Southeastern Mass. Enhancements included the addition of **all** active and inactive community water supplies. The current statewide data layer contains only active supplies larger than 100,000 gallons per day.

Regional Planning Agencies (RPA's): The RPA's data layers was modified to both correct identified errors and to reflect changes in the affiliation of a few towns.

Database Additions:

1990 TIGER & 1990 Census Tracts: MassGIS has obtained and processed the 1990 Pre-Census TIGER files. These coverages are available on a town or county basis. This data provides users with extensive attributes on road names and census geography. MassGIS has processed the raw TIGER files into a statewide data layer depicting the 1990 census tracts for Massachusetts. Also, during the summer of 1991 MassGIS expects to obtain and process the **Post-Census** TIGER files which will provide statistical

breakdowns of economic and racial demographics on a census tract basis.

Fees: TIGER data: $150 /county (9-track tape only)
$100 /town (tape or floppy)
Census Tracts: $100 /panel (2 panels cover the state)

1:250,000 Hypsography: MassGIS has processed the Defence Mapping Agency's (DMA) 1:250,000 scale Digital Terrain Models (DTM) into a statewide data layer of contours at a 30 ft. interval. While these data lack the accuracy of most of the MassGIS database they have proven very useful for showing the 'lay of the land' on regional maps.
Fees: $50 /panel (28 panels cover the state)

Wellhead Protection Areas (Zone IIs): DEP Division of Water Supply has been maintaining a data layer of Zone IIs. This layer is composed of two coverages. The first coverage includes all DEP **approved** Zone IIs. These have been delineated by hydrogeologists. The second coverage includes all interim wellhead protection areas which have been created by buffering to 1/2 mile all wells that were not used to delineate approved Zone IIs. The interim wellhead protection area is used by DEP until Zone IIs are approved.
Fees: $100 for both coverages.

Major Hydrography: MassGIS has obtained from USGS-WRD a statewide coverage depicting only the MAJOR streams and ponds in the Commonwealth. This coverage is useful for statewide plotting.
Fees: $50 for streams, $50 for ponds

Sole Source Aquifers: The DEP-DWS has automated the boundaries of the five US-EPA designated SOLE-SOURCE AQUIFERS. **Fees: $50**

Area of Critical Environmental Concern: Mass. Coastal Zone Management (CZM) and Department of Environmental Management (DEM) have completed the automation of the boundaries of the 5 inland and 13 coastal ACEC's. **Fees:$50**

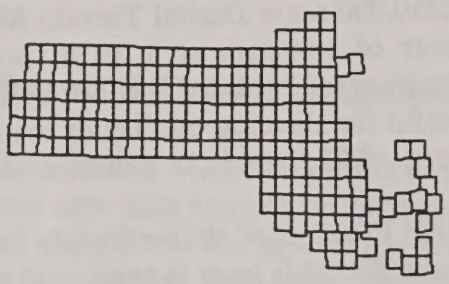
New Data Initiatives:

1991 Land Use: MassGIS is orchestrating an initiative to have a 1991 land use data layer created. The aerial photography will be flown in the spring of 1991 and UMASS will need to be contracted for the photo interpretation and digitization. Currently, Cape Cod has been completed for 1990 land use with funding coming from the Cape Cod Commission. Further funding needs to be identified in order to complete the state.

Hydrography Enhancements: MassGIS and USGS-WRD are cooperating to improve the streams and ponds data layers. Enhancements will include the automation of all features found on 1:25,000 USGS topographic quadrangles. Other improvements will assembling the data in format ready for 'network analysis'. This will imbed coding that can show up-stream/down-stream relationships.

QUADRANGLE TEMPLATE Datalayer

MassGIS
Massachusetts Executive Office of Environmental Affairs
March 1989



OVERVIEW

The MassGIS has adopted the Massachusetts State Plane Coordinate System (SPC) as its standard coordinate reference system, using the mainland zone throughout the state. The quadrangle template datalayer contains the boundaries and Massachusetts State Plane Coordinate values of the corners of the 189 1:25,000 USGS topographic sheets that cover Massachusetts. It is of great utility to any project planning to digitize information that has been compiled onto the 1:25,000 quad sheets because it insures that the data will register to the other datalayers in the MassGIS system. This datalayer is stored as a single statewide coverage named **QUADS**.

PRODUCTION

MassGIS project staff devised a simple numbering system to identify each quadrangle and the corners of all quadrangles. Staff then used an MDPW calculator containing a USGS program that translated the longitude and latitude of the quadrangle corners into Massachusetts State Plane Coordinate values. These values were put into an INFO database and used to generate an ARC/INFO datalayer. Arcs delineating the quadrangle borders were also generated.

ATTRIBUTES

The **Quads.PAT** contains two Items of note:

QUAD-ID	the unique identifier for each quadrangle
QUAD-NAME	the USGS name for each quadrangle

The **Quads.TIC** contains three Items:

IDTIC	the unique identifier for each quad corner
XTIC	the number of feet east of the SPC origin
YTIC	the number of feet north of the SPC origin

This datalayer has an INFO documentation file attached to it. It is named the **Quads.doc**. It lists pertinent facts about source material and production techniques used in the creation of this coverage.

CHECKPLOT & EDITING

MassGIS carefully proofread the SPC coordinates of the quad corners. Many plots have been made at 1:25,000 and smaller scales.

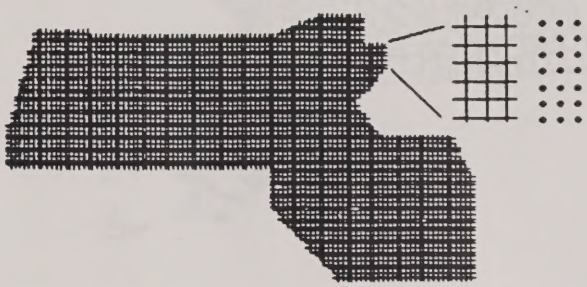
DATALAYER MAINTENANCE

A datalayer notebook is being maintained by the MassGIS. Any updates or corrections sent to MassGIS will be recorded, and datalayer modifications will be made as required.

FEE: $50.

MASS STATE PLANE GRID & POINTS Datalayer

MassGIS
Massachusetts Executive Office of Environmental Affairs
March 1989



OVERVIEW

The MassGIS has adopted the Massachusetts State Plane Coordinate System (SPC) as its standard coordinate reference system, using the mainland zone throughout the state. MassGIS has generated an SPC grid called **GRID-SPC10K**. It's grid block size is 10,000 feet on a side. The point coverage is called **PTS-SPC10K**. The points were derived from the grid intersections on the GRID-SPC10K datalayer. Either of these coverages can be plotted on a map as coordinate reference. The plotting of coordinates on a map enables that map to be used as a compilation manuscripts for further data automation. The grid or points can be used as 'TICS' to register the plot/manuscript on the digitizing table. This is of great utility to any project planning to digitize information that needs to be compiled onto GIS plots because it insures that the new data will register to the other datalayers in the MassGIS system. These two datalayers are stored as single statewide coverages.

PRODUCTION

MassGIS staff produced GRID-SPC10K using the ARC/INFO command GENERATE. The grid starts at the origin of the Massachusetts SPC Mainland Zone and has a grid block size of 10,000 feet on a side. MassGIS then made PTS-SPC10K by using the ARC/INFO command NODEPOINT, in which each node of the grid was converted into a point in the new datalayer. Next the SPC northing and easting of each point was added to the attribute database (.PAT) using the command ADDXY.

ATTRIBUTES

The SPC-PTS.PAT contains two Items of note:

X-COORD	the number of feet east of the SPC origin
Y-COORD	the number of feet north of the SPC origin

CHECKPLOT & EDITING

MassGIS carefully proofread the SPC coordinates of the quad corners.

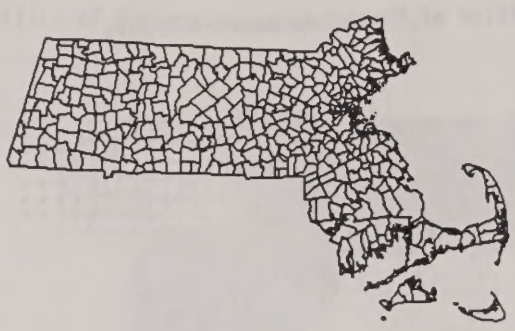
DATALAYER MAINTENANCE

A datalayer notebook is being maintained by the MassGIS. Any updates or corrections sent to MassGIS will be recorded, and datalayer modifications will be made as required.

FEE: $50. for both coverages.

COMMUNITY BOUNDARIES Datalayer

MassGIS
Massachusetts Executive Office of Environmental Affairs
March 1991



OVERVIEW

The political boundary datalayer is a 1:25,000 scale datalayer containing the boundaries of the 351 communities in Massachusetts. The seaward boundary of coastal communities has been defined at mean high water in this datalayer. The datalayer is named **TOWNS**, and it is stored as a single statewide coverage.

PRODUCTION

This datalayer, except the coastline, was digitized by MassGIS from a set of stable based film prints of the 1:25,000 7.5' quadrangles purchased from the USGS by the Massachusetts Dept. of Public Works. The coastline was taken from the USGS 1:100,000 hydrography DLG database. It was **Selected** visually and **Appended** to the digitized town boundaries.

DATALAYER DESCRIPTION

Several useful **Items** have been added to the **Towns.PAT**:

ITEM NAME	WIDTH	OUTPUT	TYPE	N.DEC	ALTERNATE NAME	Contents
AREA	4	12	F	3		
PERIMETER	4	12	F	3		
TOWNS-2#	4	5	B	0		
TOWNS-2-ID	4	5	B	0		
TOWN-ID	4	5	B	0	MASSGIS-TOWN-COD	MassGIS Town-ID Code (alphabetical, 1-351)
TOWN	21	21	C	-	TOWN-NAME	Town Name
FIPS-STCO[1]	5	5	I	-	FIPS-ID	Federal Information Processing Standard (FIPS) State & County Code
CCD/MCD[2]	3	3	C	-	CENSUS-TOWN-CODE	US Census Town Code
FIPS-PLACE[2]	5	5	C	-	FIPS-TOWN-CODE	Federal Information Processing Standard (FIPS) Town Code
POP80[1]	7	9	I	-	CEN-POPULATION80	US Census Town Population: 1980
POP90[2]	7	9	I	-	POP	US Census Town Population: 1990
ISLAND	1	1	I	-		Polygon is (1)/is NOT (0) an island - many towns are composed of many polygons.
*** REDEFINED ITEMS ***						
FIPS-MCD[2]	8	8	I	-	FIPS+CEN-TOWN-CO	FIPS State & County & Census Town Code concatenated
FIPS-COUNTY[2]	3	3	I	-	COUNTY-CODE	FIPS County only code

[1] Signifies that ITEM NAME has changed from previous version of TOWNS.
[2] Signifies that this is a NEW ITEM, not present in previous version of TOWNS.

A **TOWNS.AAT** was created. An item called OUTLINE was added. It identifies the outside polygon of the state. This enables differentiation of line type (e.g. dashed lines inside the state and solid for the outside). The outline = 1, internal boundaries = 17 (a dashed line in the MassGIS default symbolset).

This datalayer has an INFO documentation file attached to it. It is named the **TOWNS.DOC.** It lists pertinent facts about source material and production techniques used in the creation of this coverage.

Annotation has been added to the coverage. Each community is named within its border.

FUTURE ENHANCEMENTS

Work is underway to produce a more detailed shoreline based on the 1:25,000 quadrangles. When finished, this shoreline will be appended to the 1:25,000 town boundaries.

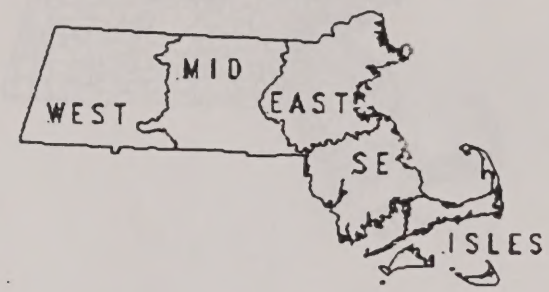
DATALAYER MAINTENANCE

A datalayer notebook is being maintained by the MassGIS. Any updates or corrections sent to MassGIS will be recorded, and datalayer modifications will be made as required.

PRICE: $100.

HYDROGRAPHY Datalayer

MassGIS
Massachusetts Executive Office of Environmental Affairs
March 1990



OVERVIEW

The MassGIS project has adapted and modified the USGS 1:100,000 Hydrography Digital Line Graph (DLG) quadrangle files to produce two core elements or coverages-

ponds and lakes (approx. 3,500 polygons)
streams and rivers (approx. 7,300 arcs)

Because of the size of the datalayers, ponds and streams have been split into five panels: **west, mid, east, se, and isle-** (see map). To avoid unnecessary splitting of features, these panels follow major drainage divides.

The coastline, the other major hydrography feature, was taken from the DLG's and appended to the manually digitized community boundaries to make TOWNS, the standard MassGIS political boundary map.

PRODUCTION

The DLG quad files were reformatted into ARC/INFO coverages and Projected into the Mass. State Plane Coordinate system. The DLG's include extensive attributes that identify feature types (Minor Code 412 = Stream, 421 = Pond, etc.). The concept used by MassGIS was to separate polygon features from line features so that appropriate attribute types and topology could be applied to each-

<stream-panel>.AAT for single line streams and rivers,
<pond-panel>.PAT for ponds and lakes.

Doubleline streams and rivers were placed in both panels.

The original attribute coding of the DLG's combined underground aqueducts and manmade surface canals. MassGIS has put the surface canals into the streams & rivers datalayer. Underground aqueducts were put into its own datalayer, as were cranberry bogs. These coverages have not been edited for general release.

Data for wetlands was not extracted from the DLG's because MassGIS is getting more accurate data from its 1:25,000 land use datalayer.

POND ATTRIBUTES

Two equivalent items were added to the **pond(-panel).AAT** to differentiate ponds, double-line streams, and islands:

NAME	the name of the feature (available for 60% - 70% of the ponds)
TYPE	character item- P = Pond, DS = Double Line River, I = Island
FEATURE	numeric item- 1 = Pond, 2 = Double Line River, 3 = Island
PALIS-ID	a unique ID from the Ponds & Lakes Information System (60% to 70% of ponds have a PALIS number)
BAS-ID	major basin code number- see MAJ-BAS datalayer description

The feature name and PALIS-ID was obtained from the UMass Water Resources Research Center.

STREAM ATTRIBUTES

The **strm-<panel>.AAT** has a unique **strm<panel>-ID** for each stream segment. The number ranges start in increments of 10,000 for each of the five hydro panels. Two items were added to the **<stream-panel.AAT>** to identify the major drainage basin each stream is in:

BAS-ID	the major basin id#
BAS-NAME	the major basin name, e.g. Merrimack

ANNOTATION

Names of the ponds and streams features have been added for cartographic display purposes. There are approximately 6,000 names. They were taken from the USGS 1:25,000 quads. The letters are 450 feet high, which makes the annotation useful for output scales ranging from 1:50,000 to 1:100,000.

Each coverage has an INFO documentation file attached to it. It is named the **<covername>.doc.** It lists pertinent facts about source material and production techniques used in the creation of each coverage.

CHECKPLOT & EDITING

After the features were sorted based on attribute, the individual quad coverages were edgematched into five panels based on drainage basins (see index map). Proofplots were produced and compared to the paper 1:25,000 quads. The 1:100,000 hydrography DLG's were found to be significantly generalized in comparison with the 1:25,000 paper quads. Many small ponds and streams were not automated by USGS. Approximately 30% of the minor streams and 20% of the minor ponds are missing from the 1:100,000 DLG's.

Lines in the DLG's were less detailed than their 1:25,000 counterparts. These differences were not considered 'errors'.

Actual errors were noted and corrected. For example, braided streams and wetlands were sometimes incorrectly coded as ponds. Edges where two blocks of 32 quads met (a USGS defined unit of production) did not often match. In these cases, streams and ponds were digitized or moved as needed to complete the edgematching process.

FUTURE ENHANCEMENTS

MassGIS plans to add missing names and unique ID numbers to ponds without a PALIS-ID.

Streams will have a **SARIS-ID** (Streams and Rivers Information System) number and a **NAME** attribute added to the database.

MassGIS has enhanced approximately 1/2 of Massachusetts by adding 1:25,000 pond and stream features missing from the 1:100,000 DLG's. This effort is ongoing.

MassGIS is acquiring 1:25,000 DLG's from the USGS as they become available, with the goal of developing a complete 1:25,000 hydrography basemap.

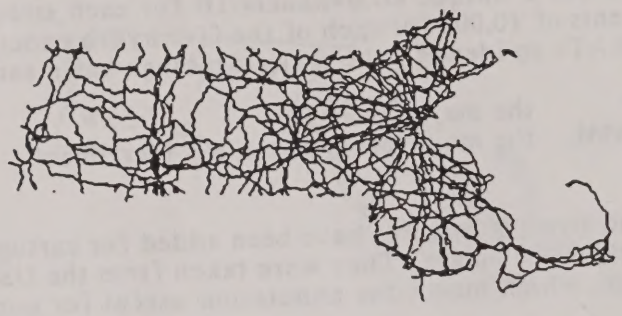
DATALAYER MAINTENANCE

A datalayer notebook is being maintained by the MassGIS. Any updates or corrections sent to MassGIS will be recorded, and datalayer modifications will be made as required.

FEE: $150. per panel.

MAJOR ROADS Datalayer

MassGIS
Massachusetts Executive Office of Environmental Affairs
March 1990



OVERVIEW

MassGIS has defined major roads as roads that are part of the INTERSTATE, US, or STATE highway systems. The datalayer, called **MAJ-RD**, contains approximately 64,000 vertices, 1,900 arcs, and 1500 pieces of annotation. It is stored as a single statewide coverage.

SOURCE

MAJ-RD is based on the USGS 1:100,000 Digital Line Graph (DLG) transportation quadrangle files. These DLG files are available for all of Massachusetts. MassGIS has also extracted railroad lines from the DLG's and put them into a separate statewide coverage. The individual DLG transportation quadrangle files, which contain all road features found on the 1:25,000 paper quads, are used by MassGIS as a detailed roads datalayer (See **ROADS** datalayer description).

PRODUCTION

The DLG quad files were reformatted into ARC/INFO coverages and projected into the Massachusetts State Plane Coordinate System. The DLG's include attributes for both the highway type (Major Code 172,173, and 174) and a Minor code that contains the actual route number. (See USGS Publication *Digital Line Graphs from 1:100,000-Scale Maps.*) Based on these attributes, MassGIS project staff **Res**elected the major roads and **Put** them into a new coverage.

Because this datalayer is meant to be used for statewide maps, or in conjunction with the complete DLG road quads on larger scale maps, complex highway intersections were deleted. Unnecessary (pseudo) nodes remaining from the complete DLG quads were removed using the **Unsplit** command. This greatly reduced the total number of arcs in the datalayer without affecting detail.

ATTRIBUTES

New items for Interstate, US, and State route numbers were added to the database. The values were calculated equal to the Major and Minor items of the original DLG's. The final MAJ-RD.AAT has the following additional items:

US-ROUTE	the route number of US Routes
STATE-ROUTE	the route number of State Routes
STATE-ROUTE-TXT	alpha suffix e.g. A for Route 1A)
INTER-ROUTE	the route number of Interstate Highways)
TYPE	1=INTER, 2=US, 3=STATE

Annotation has been added to this data using SHIELD-ANNO, a macro program written by project staff. The highway number appears inside the correct highway shield in an appropriate location near the highway. Textset Road and **Textfont 30** are needed to display the annotation correctly. These files will be distributed upon request with the Major Roads coverage. This textset is not currently available on PC ARC\INFO and at present cannot be imported to it.

CHECKPLOT & EDITING

A checkplot on mylar was made for editing purposes. It was made at 1:190,000 to match the 1" = 3 mile Mass Dept. of Public Works basemap. This basemap and the paper USGS 1:25,000 sheets were used as references when editing the checkplot.

Numerous errors and omissions were identified and corrected. Most involved missing or incorrectly identified major roads. In most cases, the correct but mislabeled road was found in the original DLG file It was **Copied** from there and **Appended** to MAJ-RD.

MassGIS staff also met with Massachusetts Dept. of Public Works staff and gathered data on a number of **changes to the highway system** that have occurred since the DLG's were produced. These changes were compiled onto 1:25,000 quad sheets, digitized, and appended into the datalayer.

This datalayer has an attached INFO documentation file, named the **MAJ-RD.DOC**. It lists pertinent facts about source material and production techniques used in the creation of the datalayer.

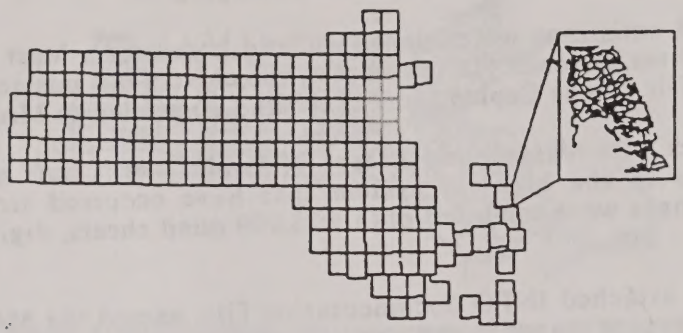
DATALAYER MAINTENANCE

A datalayer notebook is being maintained by the MassGIS. Any updates or corrections sent to MassGIS will be recorded, and datalayer modifications will be made as required.

FEE: $100.

ROADS Datalayer

MassGIS
Massachusetts Executive Office of Environmental Affairs
March 1991



OVERVIEW

MassGIS has converted the USGS 1:100,000 Digital Line Graph files into ARC/INFO coverages in the Massachusetts State Plane Coordinate System. The linework is excellent. All roads on the 1:25,000 USGS quadrangle sheets are included in these coverages, although generalized slightly. The data is stored as 189 individual quadrangle coverages named RDS<QUAD-ID>. See the attached list of quadrangle names and QUAD-ID numbers.

ATTRIBUTES

Each coverage contains 5 pairs of Major and Minor Items which contain many codes including the route numbers for Federal, US, and State numbered highways.

MAJOR1	The USGS DLG Major Code
MINOR1	The USGS DLG Minor Code
MAJOR2	" "
MINOR2	" "
MAJOR3	" "
MINOR3	" "
MAJOR4	" "
MINOR4	" "
MAJOR5	" "
MINOR5	" "
SECONDARY	Coding for ROAD TYPE (see below)

Coding for COLUMN SECONDARY:

0	= neatline or Major Road
1	= Secondary paved road
211	= Trail Class 5 other than 4-wheel drive (USGS DLG Minor Code 211)
212	= Trail Class 5 4-wheel drive only (USGS DLG Minor Code 212)
9	= Highway Interchanges (USGS DLG Minor Code 402)

More information about the 1:100,000 DLG's including the Major/Minor code descriptions can be found in the USGS National Mapping Division Publication, *Digital Line Graphs from 1:100,000-Scale Maps.*

The Major Roads Datalayer was extracted from these coverages, but contains corrections and updates not transfered back into the ROADS quadrangles . Production of the Major Roads Datalayer revealed many attribute coding errors.

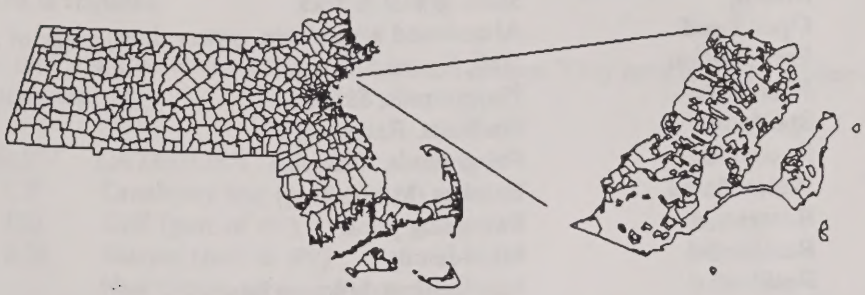
DATALAYER MAINTENANCE

MassGIS is not, at present, revising or updating this datalayer. MassGIS will add any corrections to the datalayer notebook for possible revisions in the future.

PRICE: $50. per quad.

LAND USE Datalayer

MassGIS
Massachusetts Executive Office of Environmental Affairs
March 1990



OVERVIEW

The MassGIS statewide 1:25,000 land use datalayer has 21 land use classifications interpreted from 1:25,000 1985 aerial photography. 1971 classifications are also imbedded in the database.
The project is scheduled to be complete early in 1990. This datalayer is stored in individual community coverages.

PRODUCTION

Photointerpretation and automation is done by the Resource Mapping Project at the University of Massachusetts, Amherst. The RMP staff aggregates the 104 classes of their original 1971 interpretation into 21 categories and digitizes the data into individual community digital coverages using a PC version of Arc/Info software. The RMP staff then visually compares the 1971 photography and 1985 photography and produces a digital map of only 1971-85 **change** for each community. Interpretation is made from 1:25,000 9"x9" color infrared photos flown in Summer 1985. Southeastern Mass was flown in September 1984. The flight and photography was funded by the Massachusetts Dept. of Environmental Management for another project.

PROCESSING

The MassGIS uses the mainframe version of ARC/INFO to combine the 1971 and 1985 change datalayers to produce a third datalayer- 1985 land use, and two related databases.

One database is the standard ARC/INFO Polygon Attribute Table (**.PAT**).
The **LU85-<Community#>.PAT** record for each land use polygon includes the following ITEMS:

AREA-ACRES	
LUNUM	land use code for 1971
CHNUM	1971-85 change code
LU-1985	land use code for 1985

A frequency database (**LU85-<community#>.FRQ**) is also created. This aggregates the acreage statistics into community-wide totals.

The process of combining the two datalayers created some 'sliver polygons'. These result when a theoretically coterminous line in each coverage is actually offset due to it having been digitized twice, e.g. the shore of a lake. Many of these slivers have been eliminated by screening for an area/perimeter ratio beyond normal limits. Some slivers remain. They have the correct coding, but should actually be merged with an adjacent polygon.

The community code numbers are an alphabetically ordered list of the 351 communities in Massachusetts. This list can be found in an appendix to the MassGIS 'Draft Digital Data Standards'.

LAND USE CODE DEFINITIONS

CODE	ABBREV	CATEGORY	DEFINITION
1	AC	Cropland	Intensive agriculture
2	AP	Pasture	Extensive agriculture
3	F	Forest	Forest
4	FW	Wetland	Nonforested freshwater wetland
5	M	Mining	Sand, gravel & rock
6	O	Open Land	Abandoned agriculture, power lines, areas of no vegetation
7	RP	Participation Recreation	Golf, Tennis, Playgrounds, Skiing
8	RS	Spectator Recreation	Stadiums, Racetracks, Fairgrounds, Drive-ins
9	RW	Water Based Recreation	Beaches, Marinas Swimming pools
10	R0	Residential	Multi-family
11	R1	Residential	Smaller than 1/4 acre lots
12	R2	Residential	1/4 - 1/2 acre lots
13	R3	Residential	Larger than 1/2 acre lots
14	SW	Salt Wetland	Salt Marsh
15	UC	Commercial	General urban, shopping center
16	UI	Industrial	Light & heavy industry
17	UO	Urban Open	Parks, cemeteries, public & institutional greenspace, also vacant undeveloped land
18	UT	Transportation	Airports, Docks, Divided Hwy Freight storage, Railroads
19	UW	Waste Disposal	Landfills, sewage lagoons
20	W	Water	Fresh Water,Coastal Embayment
21	WP	Woody Perennial	Orchard,Nursery,Cranberry Bog
22	No Change		

Several additional categories of land use were added for parts of Massachusetts:

The communities in the **Southeastern Regional Planning & Economic Development District** (SRPEDD) west of Buzzards Bay have a total of 28 land use classes. They have the same 22 categories mentioned above except that #14 is marina, not salt wetland. Additions:

CODE	ABBREV	CATEGORY
14	RM	Marinas (part of #9 in the rest of the state)
23	CB	Cranberry bog (part of #21)
24	PL	Powerlines (part of #6)
25	RSB	Saltwater sandy beach (part of #9)
26	RG	Golf (part of #7)
27	TSM	Tidal salt marshes (part of #14)
28	ISM	Irregularly flooded salt marshes (part of #14)

The .PAT for these communities has the same 4 ITEMS mentioned above and 2 additional ITEMS:

LUNUM28	28 land use codes for 1971
LU28-1985	28 land use codes for 1985

In this manner, data can be displayed with either 28 or 22 classes, depending upon whether statewide consistency or maximum detail is required.

The communities on **Cape Cod** have a total of 26 land use classes. They have the core 22 (see above). The four additional categories are:

CODE	ABBREV	CATEGORY
23	CB	Cranberry bog (part of #21)
26	RG	Golf (part of #7)
29	RM	Marina (part of #9)
30	-	New Ocean (areas of accretion)

Additional items LUNUM-CP, and LU-CP-1985 have also been added to the Cape Cod communities. Again, depending on user needs, data can be displayed in the standard 22 classes, or in 26 classes depending on user needs.

All land use categories were aggregated from 104 categories originally defined in 1971. Further information on them can be obtained from Professor William MacConnell at the Dept. of Forestry, University of Massachusetts, Amherst.

Each coverage has an INFO documentation file attached to it named the **<covername>.doc.** It lists pertinent facts about source material and production techniques used in the creation of each coverage.

CHECKPLOTS & EDITING
Each land use coverage was plotted at a scale of 1:25,000 by the RMP before delivery to MassGIS.

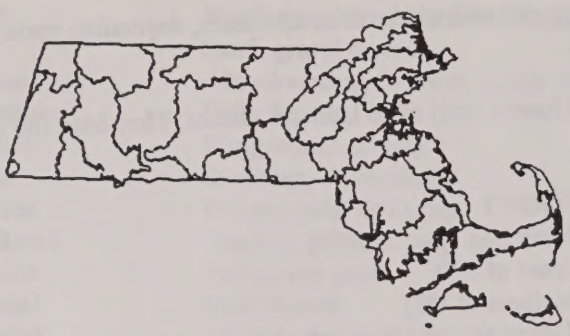
DATALAYER MAINTENANCE
Remotely sensed land use cannot be expected to be interpreted with 100% accuracy. A datalayer notebook is being maintained by MassGIS. Any updates or corrections sent to MassGIS will be recorded, and datalayer modifications will be made as required.

Citation:
This project is being funded by the Massachusetts Executive Office of Environmental Affairs, the Massachusetts Dept. of Public Works, and several regional planing agencies. Photointerpretation and digitizing is done by the Resource Mapping Project (RMP) of the U. Mass. Dept. of Forestry. The MassGIS Project is providing project management and data processing.

PRICE: $100. per community.

MAJOR DRAINAGE BASIN Datalayer

MassGIS
Massachusetts Executive Office of Environmental Affairs
March 1990



OVERVIEW

The MassGIS Project has produced a statewide digital datalayer of the 28 major drainage basins of Massachusetts as defined by the USGS Water Resources Division and the Mass Water Resources Commission. The datalayer is called MAJ-BAS. It contains 885 arcs and 82,000 vertices. It is stored as a single statewide coverage.

SOURCE MANUSCRIPT

A set of 1:24,000 USGS paper quad sheets was carefully delineated with approximately 1800 minor or sub- drainage basins. This work was produced over the past 20 years by the USGS-WRD. Generally, the contours on the quads are the primary guide to basin boundaries. Often the 'mouth' of a basin is marked at the site of a stream gaging station, which can be different from the strict geographic location of the mouth.

PRODUCTION METHODOLOGY

The major basins were produced from the sub-basins using the Arc/Info Dissolve command. This removed all lines except boundaries between major basins. This was possible because the Major Basin # is encrypted in the Sub-Basin-ID

The resulting Massachusetts internal major basin boundaries were then Appended to the state outline and shoreline, and processed to result in a statewide polygon datalayer, which is a digital facsimile of the Massachusetts Water Resources Commission official Massachusetts Drainage Basins Map.

All sub-basins on the manuscripts were automated (refer to SUB-BASINS Datalayer description). Because of good manuscript quality including the visual edgematching of the 189 sheets, digitizing and edgematching was straightforward, in spite of the paper manuscripts. The manuscript author was consulted on the minor errors and ambiguities that were discovered.

ATTRIBUTES

The MAJ-BAS.PAT contains 260 polygons because of the many coastal islands. The Maj-Bas.PAT (Polygon Attribute Table) contains several items in addition to the standard Arc/Info .PAT:

SQ. MILE	of each polygon
AREA-ACRES	of each polygon
BAS-ID	maj-bas numbers 1 to 28
NAME	each major basin has a name

KEY TO THE MAJOR BASIN NUMBERING SYSTEM

BASIN #	BASIN NAME
1	Hudson
2	Housatonic
3	Deerfield
4	Westfield
5	Farmington
6	Connecticut
7	Millers
8	Chicopee
9	Quinebaug
10	French
11	Nashua
12	Blackstone
13	Merrimack
14	Concord
15	Shawsheen
16	Parker
17	Ipswich
18	North Coastal
19	Boston Harbor
20	Charles
21	South Coastal
22	Cape Cod
23	Islands
24	Buzzards Bay
25	Taunton
26	Narragansett Bay & Mt. Hope Bay Shore
27	Ten Mile
28	Massachusetts Coastal

The Major Basin.AAT contains an item called OUTLINE. This enables the state border and shoreline to be differentiated from interior lines. This enables a different line type to be used for the outline of the state.

The Major Drainage Basin datalayer has an INFO documentation file attached to it. It is named MAJ-BAS.doc. It lists pertinent facts about source material and production techniques used in the creation of this datalayer.

CHECKPLOT & EDITING

Each panel was plotted at 1:48,000 and compared to the digitizing manuscript.

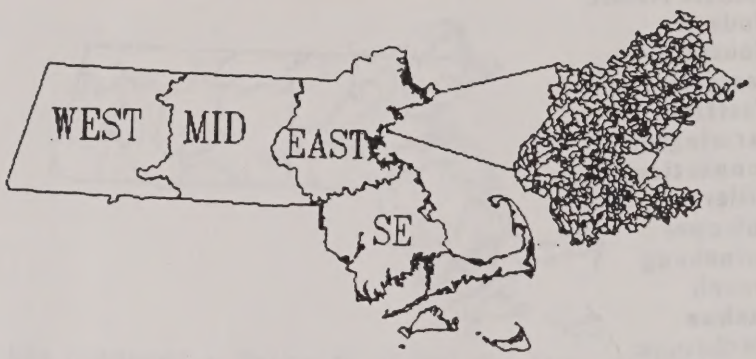
DATALAYER MAINTENANCE

A datalayer notebook is being maintained by the MassGIS. Any updates or corrections sent to MassGIS will be recorded, and datalayer modifications will be made as required.

FEE: $100.

DRAINAGE SUB-BASIN Datalayer

MassGIS
Massachusetts Executive Office of Environmental Affairs
March 1990



OVERVIEW

The MassGIS Project has produced a statewide digital datalayer of the approximately 1800 sub-basins as defined and used by the USGS Water Resources Division and the Mass Water Resources Commission for various projects. These are the sub-basins that were aggregated together to make the 28 basins of the Major Basins Datalayer. The sub-basin datalayer is stored in four panels which are aggregated major basins- WEST, MID, EAST, SE (see map). Cape Cod and the Islands do not have much lateral 'surface' drainage because the soils are so porous. Therefore they were not compiled by USGS-WRD. The sub-basins have not yet been joined to the Massachusetts shoreline or to the interior state boundary.

SOURCE MANUSCRIPT

A set of 1:24,000 USGS paper quad sheets had been delineated into approximately 1800 minor or drainage subbasins. This work was produced over the past 20 years mainly by the USGS-WRD. Generally, the contours on the quads are the primary guide to basin boundaries. Often the 'mouth' of a basin is marked at the site of a stream gaging station, which can be different from the strict geographic location of the mouth.

PRODUCTION METHODOLOGY

All sub-basins on the manuscripts were automated. Because of good manuscript quality including the visual edgematching of the 189 sheets, digitizing and edgematching was straightforward, in spite of the paper manuscripts. The manuscript author was consulted on the minor errors and ambiguities that were discovered.

ATTRIBUTES

Each sub-drainage basin has a unique 5 digit SUB-ID number that was adapted from the numbering system on the manuscripts. The numbers are roughly hierarchically ordered based on the sub-basins position within the major basin. The ID-numbers ascend as the water descends. The first two numbers in the 5 digit code identify the 28 major basins as numbered in Massachusetts (see listing in the Major Basins Datalayer Description). This 2 digit code is duplicated in the **(redefined) MAJ-BAS** ITEM. The last three numbers in the **SUB-ID** are duplicated in the **(redefined) POSITION** ITEM.

CHECKPLOTS & EDITING

The entire datalayer was plotted at 1:100,000, selected areas at 1:25,000. Edgematching was done. The manuscript often had more than 1 ID per sub-basin. One was chosen by MassGIS.

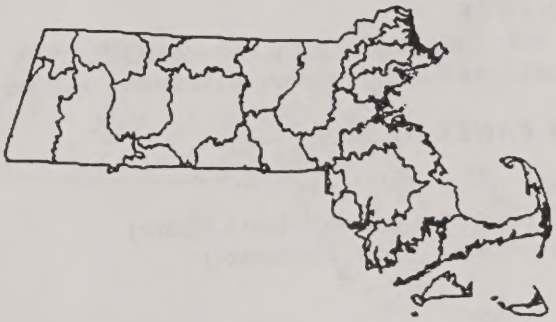
DATALAYER MAINTENANCE

A datalayer notebook is being maintained by the MassGIS. Any updates or corrections sent to MassGIS will be recorded, and datalayer modifications will be made as required.

FEE: $150. per panel.

AQUIFERS Datalayer

MassGIS
Massachusetts Executive Office of Environmental Affairs
March 1990



OVERVIEW

MassGIS has produced an aquifer datalayer composed of 20 individual panels, generally based on the boundaries of the major drainage basins. Areas of high and medium yield are mapped. The panels are called AQ-<BASIN>. See attached list of panel names.

SOURCE MANUSCRIPT

The USGS 1:48,000 hydrologic atlas series on groundwater favorability has been produced for all of Massachusetts. The basemaps for these were photographically reduced and spliced together from 1:24,000 USGS quadrangles. Each manuscript covers one of the major drainage basins. They have been individually researched and published by the USGS-WRD starting in the 1960's and continuing to the present. A couple have been compiled but not yet published. In these cases the draft manuscripts were automated.

The definition of high and medium yield varies between panels, as it does on the source manuscripts. For example, AQ-CONCORD defines medium yield as between 100 and 300 GPM (gallons per minute), while AQ-CONNECTICUT defines medium as 25-1000 GPM. Most of the panels have definitions close to or the same as AQ-CONCORD. See each panel documentation for the precise definitions.

The USGS manuscripts were not edgematched to adjacent panels.

PRODUCTION

The high and medium yield categories were automated from the manuscripts. The major drainage basin boundary was copied from the **MAJ-BAS** coverage to use as a template for digitizing. Because ponds and lakes are also closely related to aquifers, they were clipped from the ponds datalayer and also used as a template. No attempt has been made to resolve interpretation inconsistencies between panels.

ATTRIBUTES

Both a polygon attribute table (.PAT) and an arc attribute table (.AAT) were created for each aquifer panel. The AAT has one item called OUTLINE. The drainage basin boundary is coded as '1'. All other arcs are coded as '0'.

The **AQ-<basin>.PAT** has the following ITEMS:

CODE	1=pond, 2=high yield, 3=medium yield
TYPE	character values the equivalent of the CODE item
YIELD	yield per minute for the aquifer classes
TRANSMISSIVITY	square feet per day
AREA-ACRES	area in acres of each polygon

CHECKPLOT & EDITING
Plots of each panel were made at a scale of 1:48,000 and compared to the source map. Corrections were made as needed.

DATALAYER MAINTENANCE
A datalayer notebook is being maintained by the MassGIS. Any updates or corrections sent to MassGIS will be recorded, and datalayer modifications will be made as required.

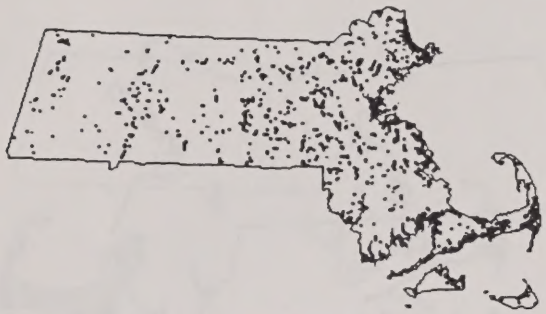
AQUIFER DATALAYER PANEL NAMES

AQ-BLACKSTONE
AQ-BOS-MYSTIC (includes coastal North Shore)
AQ-BOS-WWN (Weymouth, Weir, Neponset)
AQ-BUZZARDS
AQ-CHARLES
AQ-CHICOPEE
AQ-CONCORD
AQ-CONN (Connecticut)
AQ-DEERFIELD
AQ-FRENCH-QUIN (French, Quinebaug)
AQ-HOOSIC
AQ-HOUSATONIC
AQ-IPSWICH
AQ-ISLANDS (Marthas Vineyard & Nantucket)
AQ-MERRIMACK
AQ-MILLERS
AQ-NARR-HOPE (Narragansett & Mt. Hope Bay)
AQ-NASHUA
AQ-PARKER
AQ-SCOAST
AQ-SHAWSHEEN
AQ-TAUNTON
AQ-TENMILE
AQ-WEST-FARM (Westfield, Farmington)
AQ-WEWEANTIC (parts of Buzzards Bay & South Coast)

FEE: $100. per panel.

PUBLIC WATER SUPPLIES

MassGIS
Massachusetts Executive Office of Environmental Affairs
March 1990



OVERVIEW

The Public Water Supplies datalayer was compiled by the USGS-Water Resources Division from SWUDS (State Water Use Database System) as of January 1990. The database contains 1072 active municipal and other public water supplies. Both wells and surface water supplies are included. The data is stored as a single statewide coverage. It is named **PWS-2-90.**

SOURCE MANUSCRIPT

The public water supplies database was constructed in a tabular database by the USGS-WRD. This database includes latitude and longitude items.

PRODUCTION METHODOLOGY

Most water supplies were field verified by USGS-WRD. Some of the locations were verified in the office using maps and other information sources. MassGIS took the latitude and longitude out of the tabular database, generated the points as an Arc/Info coverage, and projected them into the Massachusetts State Plane Coordinate system.

ATTRIBUTES

This datalayer has a **.PAT** (point attribute table) with a number of attributes associated with each public water supply:

STNAME	name of water supplier
PWSID	DEP public water supplier identification number
SITE-NAME	name of water supply
USGS-ID	a 15 digit ID# combining lat. & long and a 2 digit code for multiple supplies at one site
TYPE	GW = groundwater, SW = surface water
LATITUDE	
LONGITUDE	
SOURCECHECK	FC = field checked, OC = office checked, U = unchecked
OTHER	additional USGS information

CHECKPLOT & EDITING

Most locations were verified by USGS. DEP Division of Water Supply is developing further verification procedures.

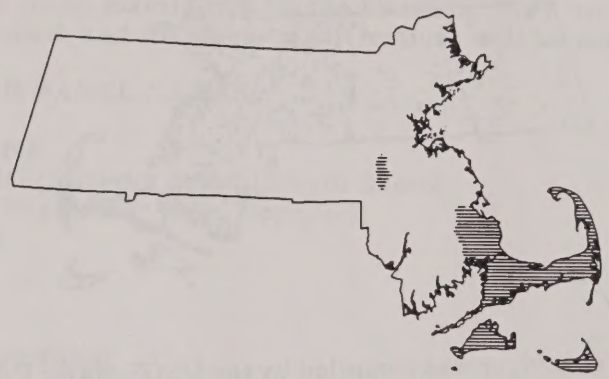
DATALAYER MAINTENANCE

The Department of Environmental Protection, Division of Water Supply is maintaining this datalayer.

FEE: $100.

EPA DESIGNATED SOLE SOURCE AQUIFERS Datalayer

MassGIS
Massachusetts Executive Office of Environmental Affairs
February 1991



OVERVIEW

The Sole Source Aquifer datalayer was compiled by the Department of Environmental Protection (DEP) Division of Water Supply (DWS). Five Sole Source Aquifers have been designated by the US EPA for Massachusetts. The Sole Source Aquifers are stored as a polygon coverage, **SSA**. A Sole Source Aquifer (SSA) is an aquifer designated by US EPA as the 'sole or principal source' of drinking water for a given aquifer service area; that is, an aquifer which is needed to supply 50% or more of the drinking water for that area and for which there are no reasonably available alternative sources should that aquifer become contaminated.

SOURCE MANUSCRIPT

The Neponset SSA was obtained in digital format from US EPA Region 1, while the Plymouth-Carver SSA was digitized from a source map at DEP. The other SSAs were reselected from MassGIS's Towns coverage, because whole towns and shorelines defined those SSAs.

PRODUCTION METHODOLOGY

With the PROJECTION command the Neponset SSA was projected from a UTM coverage to one in state plane feet. The Plymouth-Carver SSA was simply imported from the DEP-DWS pcARC/INFO. Then, with a RESELECT command the other 3 SSAs: Martha's Vineyard, Nantucket and Cape Cod were obtained. Finally, the SSAs were combined into a single coverage. A checkplot was then submitted to US EPA for verification.

ATTRIBUTES

This datalayer has a **.PAT** with the following attributes associated with each polygon:

SSA_NUM	a unique id for each SSA
SSA_NAME	the name of the SSA

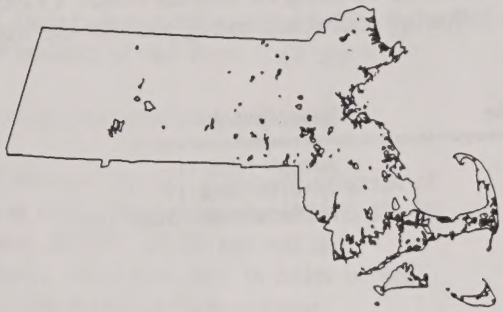
Several small waterbodies also are found within this coverage. These have been coded with a SSA_NAME of 'WATERBODY'.

DATALAYER MAINTENANCE

The DEP, Division of Water Supply is maintaining this datalayer.
PRICE: $50.

DEP APPROVED ZONE IIS Datalayer

MassGIS
Massachusetts Executive Office of Environmental Affairs
March 1991



OVERVIEW

The Department of Environmental Protection (DEP) approved Zone IIs data layer was compiled by the DEP Division of Water Supply (DWS). The database contains 101 Zone IIs statewide. The Zone IIs are stored as a polygon coverage, ZONE_IIS. An attribute table, ZONE_IIS.SHR is to be used in conjunction with the coverage.

As stated in 310 CMR 22.02, a Zone II is

> 'that area of an aquifer which contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated (180 days of pumping at safe yield, with no recharge from precipitation). It is bounded by the groundwater divides which result from pumping the well and by the contact of the aquifer with less permeable materials such as till or bedrock. In some cases, streams or lakes may act as recharge boundaries. In all cases, Zone IIs shall extend up gradient to its point of intersection with prevailing hydrogeologic boundaries (a groundwater flow divide, a contact with till or bedrock, or a recharge boundary).'

These data are used in association with the Public Water Supplies data layer. The following describes certain unique features of this association.

- Any proposed new well which will pump at least 100,000 gallons per day must have a Zone II delineation completed and approved by DEP prior to the well coming on line. In such an instance, a Zone II may **not** have an installed well point associated with it because the information for Zone II delineation was derived **from test wells** and the pumping wells await approval before installation.

- Additionally, a new source may not be on-line yet, but **other, older wells** may fall within its Zone II boundary. In other words, some wells 'within' a Zone II may **not** have been used to delineate that Zone II.

- Further, existing wells must have a Zone II delineated as a condition of receiving a water withdrawal permit under the Water Management Act.

Interim Wellhead Protection Areas:

In the absence of a DEP approved Zone II for any well, DEP has adopted the 1/2 mile Interim Wellhead Protection Area, or Interim Zone II, as the primary recharge area for that well. These 1/2 mile Interim Wellhead Protection Areas are stored in a separate coverage called ZIIS-INT. ZIIS-INT contains Arc/INFO derived 1/2 mile interim wellhead protection buffers. (NOTE: ZIIS-INT-SE is the buffered coverage for CWS-DEP-SE the Southeast Community Public Water Supplies coverage which contains more wells than the

PWS-2-90 coverage - refer to the separate data layer documentation of this coverage for details).

Zone IIs and groundwater supplies data are closely linked. In both water sources coverages (CWS-DEP-SE and PWS-2-90), an item, ZII-DEF, has been added to distinguish which wells were used to delineate **actual Zone IIs** and which ones were used to create **interim Zone IIs**. The wells requiring 1/2 mile Interim Wellhead Protection Areas were identified by selecting all sources whose TYPE is groundwater (GW) and whose ZII-DEF is **not** 'actual'. The following coding scheme applies for the item ZII-DEF in the **PWS-2-90 (and CWS-DEP-SE) coverage:**

ZII-DEF-Code	Description
1	Actual Zone II
2	Interim Zone II
0	Surface Water Supplies

SOURCE MANUSCRIPT

The Zone IIs were recompiled onto the DEP Water Supply Protection Atlas from the final technical reports generated as a result of the following Water Supply programs:

a. Source Approval Program,
b. Zone II Technical Assistance Program,
c. Aquifer Land Acquisition Program, and
d. Water Supply Contamination Correction Program.

The Zone IIs were then digitized from the Atlas (1:25,000) by DEP-DWS staff.

PRODUCTION METHODOLOGY

After the technical reports are reviewed for completeness, the Zone II boundaries are transferred, in pencil, to the Water Sources overlay of the Water Supply Protection Atlas housed at DEP-DWS in Boston. The Zone IIs are then inked on the overlay using a size 0 (.35 mm) technical pen. Finally the Zone IIs are digitized on the DEP-DWS PC workstation. Periodically (approximately twice a year), the Zone IIs are updated by DEP-DWS. This step involves adding, superseding and modifying the Zone IIs.

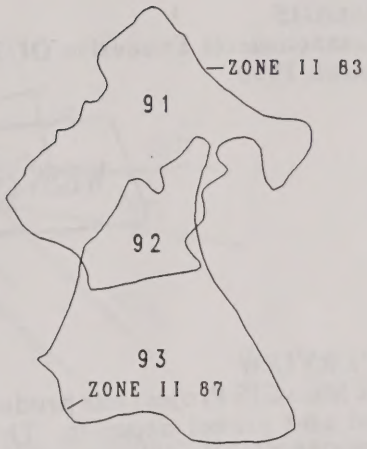
ATTRIBUTES

Polygon Attributes:
This datalayer has a **.PAT** (polygon attribute table) with the following attributes associated with polygon of a Zone II:

ZONE_IIS-ID	the unique identifier of each **polygon**
AREA-ACRES	the area, in acres, of each polygon
ZII-FRQ	the number of Zone IIs sharing that polygon (several Zone IIs may overlap)

Handling Overlap:
Because wells tend to be clustered by the nature of the resource they tap, Zone IIs protecting those wells will frequently overlap. As a result, intersecting Zone IIs will be broken up into several polygons. With this overlap, more than one Zone II could share a particular polygon. Since the overlap area (polygon 92 in the illustration) may be shared by two Zone IIs, one cannot use ZONE_IIS-ID (the polygon identifier) to find the entire Zone II. How can one determine if that shared polygon is coded, as 'Zone II 83' **or** as 'Zone II 87'? INFO only allows for a one to one relationship to be represented, however, a one to many relationship is required.

To handle the shared polygons problem, a second INFO file called ZONE_IIS.SHR was created. This second file stores the **Zone II identifier** as well as the polygon identifier (ZONE_IIS-ID). The items of ZONE_IIS.SHR include:



ZONE_IIS-ID the unique id of each **polygon** (also stored in .PAT)
ZII-NUM the unique DEP number of the **Zone II** (Zone II identifier)
NUM-POLYS the number of polygons comprising a Zone II

The ZONE_IIS-ID of both these files are equal. A sample diagram of the illustrated Zone IIs is shown at right. Note how **one** ZONE_IIS-ID record for polygon 92 relates to **two** ZONE_IIS-ID records in ZONE_IIS.SHR (see arrows below). Also, note how in order to 'see' **all** of "ZONE II 83" one must be able to select **both** polygon ZONE_IIS-ID 91 **and** polygon ZONE_IIS-ID 92 (see highlighted portion of ZONE_IIS.SHR.

ZONE_IIS.PAT

ZONE_IIS-ID	AREA-ACRES	ZII-FRQ
91	479	1
92	165	2
93	480	1

ZONE_IIS.SHR

ZONE_IIS-ID	ZII-NUM	NUM-POLYS
91	**83**	2
92	**83**	2
92	87	2
93	87	2

Since the ZONE_IIS-ID are both equal in both files, a one-to-many relate can be executed. A relate is performed on ZONE_II.SHR using ZONE_IIS-ID to reselect a Zone II based on ZII-NUM.

Arc Attributes:
ZONE_IIS also has line topology and an **.AAT** (arc attribute table) with items:

ZONE_IIS-ID the unique id of the **arcs** of the Zone II
ZII-NUM the number of the Zone II as recorded by DEP DWS Technical Services to identify each Zone IIs

These two numbers are equal to each other and ZII-NUM has the same value as ZII-NUM in the table ZONE_IIS.SHR. In order to select all **arcs** composing a single Zone II one can use the .AAT item ZII-NUM.

****** NOTE ******

The ZII-NUM corresponds to a specific DEP DWS Technical Services document that references the Zone II back to its hard-copy report which contained the source manuscript. It is strongly suggested that if ZONE_IIS are to be used for any local level work, the original documents, located at DEP's Boston Office, be referred to for critical, site specific information.

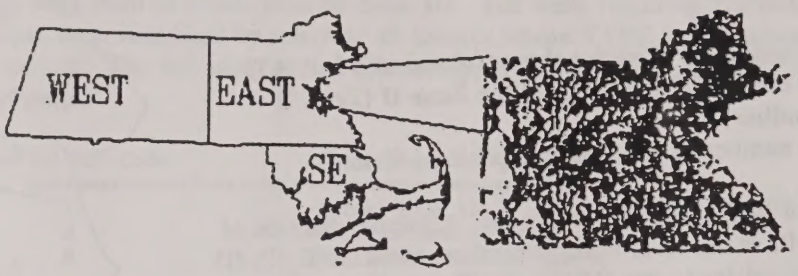
DATALAYER MAINTENANCE

The Department of Environmental Protection, Division of Water Supply is maintaining this datalayer. Comments or questions can be referred to Anita Beinikis at DEP-DWS 617-292-5581.

Price: $100 for both approved and interim Zone II coverages

SURFICIAL GEOLOGY Datalayer

MassGIS
Massachusetts Executive Office of Environmental Affairs
March 1990



OVERVIEW

The MassGIS Project has produced a statewide surficial geology datalayer showing the location sand and gravel deposits. The state is divided into three panels- west, east, and southeast. These correspond to the USGS 1:250,000 map sheets that were used as a basemap.

This datalayer is very generalized when compared to the other MassGIS data. MassGIS only uses the surficial geology data to produce aggregate measurements over a large area, e.g. a drainage basin. It is not accurate for site specific analysis.

SOURCE MANUSCRIPT

This datalayer was interpreted and compiled by Byron Stone, a USGS geologist. No interpretation was made as to thickness. A set of USGS 1:250,000 film basemaps were enlarged onto stable based film at a scale of 1:125,000. The data was then recompiled from a set of 1:25,000 quadrangle sheets onto the 1:125,000 basemap. This manuscript does not precisely register with the standard MassGIS basemap datalayers such as the shoreline and hydrography.

PRODUCTION METHODOLOGY

The tics of the Universal Transverse Mercator manuscripts were projected into the MassGIS State Plane coordinates before digitizing began. Polygons were labeled and a checkplot was made at manuscript scale.

ATTRIBUTES

An item called **CODE** was added to the .PAT of each panel. A value of 1 means that the polygon has surficial sand & gravel. A value of 0 signifies till or bedrock.

CHECKPLOT & EDITING

Plots were made at a scale of 1:125,000 and compared to the original manuscripts. No attempt was made to alter the datalayer to conform with other MassGIS datalayers.

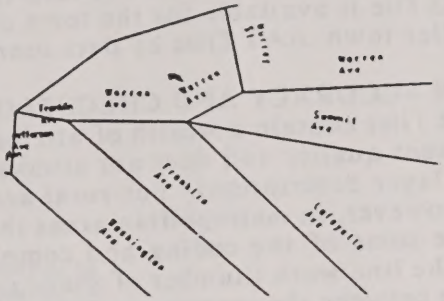
DATALAYER MAINTENANCE

MassGIS is not, at present, revising or updating this datalayer. MassGIS will add any corrections to the datalayer notebook for possible revisions in the future.

FEE: $100. per panel.

US Census TIGER Data

MassGIS
Massachusetts Executive Office of Environmental Affairs
November 1990



OVERVIEW

The US Bureau of the Census developed and now distributes the Topologically Integrated Geographic Encoding and Referencing System (TIGER) data sets as part of the 1990 Decennial Census. These data are available nationwide and serve as a geographic framework for Census summary statistical and demographic data. EOEA has obtained these data and has reprocessed them into Arc/INFO format and the Mass. State Plane Coordinate System which matches the existing MassGIS data base.

PRODUCTION

County Coverages:
US Census TIGER files were obtained for the 14 counties composing Massachusetts. The data were converted into Arc/INFO format using the **TIGERARC** command and following a procedure recommended by ESRI. The TIGER coverages were processed using **'double precision'** accuracy and then were **projected** into the Mass. State Plane Coordinate system. **Line topology** was then added to the coverage. Next, the Census **minor civil division codes** (columns FMCDCCD90L and FMCDCCD90R) were converted to the MassGIS standard **town-id code** and were moved into the Arc Attribute Table (.AAT) as TOWNL and TOWNR. This allows users to interact with a town's data using the familiar MassGIS standard town coding. **Polygon topology** was then added to the coverage. Finally, the arc based attributes that describe census geography (census block and tract codes) were transferred from the Arc Attribute Table (.AAT) to the Polygon Attribute Table (.PAT). This allows users to easily **reselect** the subsets of a county's census geography that they wish to use in a polygon format.

Several manipulations were made to the attribute data. A full suite of US Census TIGER attributes can be found in the **.ACODE** file of each coverage. The .ACODE file can be related to the Arc Attribute Table of each county coverage. The .ACODE file has **more records than there are arcs** in the coverage. This results because Census stores an 'alternate feature name' for features which have more than one name (an example is Memorial Drive which is also known as Rte. 3). A subset of the of the .ACODE columns was then joined back to the Arc Attribute Table (see the complete column listing below). Also included with each county data set is a simple look-up-table (a **.PLC file**) of FMCDCCD90 codes and MassGIS Town-Id codes (this table is also described in detail below). Last, TIGER File #3, which stores the 1980 Census geographies (1990 and 1980 tract and blocks may be different) was processed by MassGIS. A .003 table was created by MassGIS and is distributed with the data that stores this coding. This allows the use of the 1990 TIGER files to create either 1980 or 1990 census geographies from the same set of 1990 TIGER line work (this table is also described below).

Town Coverages:
The town based TIGER files that MassGIS distributes were created by following the same steps as above, however, a few additional steps were added to create these smaller files. First, all of the Arcs with the given TOWN-ID code were reselected into their own coverage. Next, polygon topology was recreated for these smaller units. Next, all related records from the

county .ACODE file were pulled into a smaller .ACODE file for the town. Finally, each town coverage was prepared for addressmatching in the Arc/INFO environment. ADDRESSCREATE was used to establish an .ADD file (see below) and then the coverage was ADDRESSBUILT to fix the link between the .ADD file and the actual arcs. Only the entire County .003 file is available for the town coverages. This large file can be joined or related to the smaller town .AAT files by data users.

NOTES ON ACCURACY AND CHECKPLOTTING

The TIGER files contain a wealth of attribute information. The accuracy of the linework is of inconsistent quality and does not always match the 1:100,000 USGS DLG roads data (see roads data layer description). For rural areas, the DLG roads were used by Census for the linework, however, in metropolitan areas the 1980 Census DIME files were used as the roads base. While some of the coding and completeness errors of the DIME were corrected the quality of the line work (number of shape points) was not. In order to maintain the complex relationship between the graphics and the attribute tables MassGIS has not altered the TIGER line work in any way (except to change projection and coordinate system). Several detailed descriptions of the TIGER data automation processes are listed at the end of this document.

MassGIS has performed extensive spot checking on the TIGER files. Due to the large volume of data not every town in the Commonwealth has been systematically checked. The TIGER files contain many errors that were created by Census during the production process. These errors include attribute coding mistakes. Other types of known TIGER errors include the existence of extremely small line segments and polygons. For instance MassGIS has found legitimate Arcs that are smaller than .1 feet in length. While these arcs have little meaning in a cartographic data base they are part of the TIGER data structure, and without them the relationships between graphics and attributes are degraded or destroyed. MassGIS has not corrected any of these types of errors in the TIGER files.

TIGER ATTRIBUTES

As was stated, the MassGIS Arc/INFO TIGER files are distributed with several INFO files. The columns of each INFO file are described below:

TIG-<county>.AAT Arc Attribute Table

COLUMN	ITEM NAME	WIDTH	TYPE	DESCRIPTION
1	FNODE#	4	B	From node #
5	TNODE#	4	B	To node #
9	LPOLY#	4	B	Left poly #
13	RPOLY#	4	B	Right poly #
17	LENGTH	8	F	Length
25	TIG-<county>	4	B	System ID
29	TIG-<county>-ID	4	B	User ID
33	CFCC	3	C	Census Feature Class Code (see columns SYMBOL, below)
36	CTBNA90L	6	C	Census Tract BNA # Left
42	CTBNA90R	6	C	Census Tract BNA # Right
48	BLK90L	4	C	Tabulation Block # Left
52	BLK90R	4	C	Tabulation Block # Right
56	ZIPCOLEF	5	I	Zip Code Left
61	ZIPCORGT	5	I	Zip Code Right
66	FPR	4	B	FIPS Place Code Left
70	FPL	4	B	FIPS Place Code Right
74	NAME4	38	C	Feature direction prefix, feature name, feature direction suffix, feature type, concatenated together.
112	TOWNR	4	B	MassGIS Town-ID code left
116	TOWNL	4	B	MassGIS Town-ID code right
120	SYMBOL	4	B	MassGIS draw symbol number. This field contains an Arc/INFO symbol number which differentiates MAJOR ROADS from SECONDARY ROADS based on the CFCC column. All other TIGER features such as HYDROGRAPHY, TRAINS, etc. have no symbol number. WARNING: Some counties are missing the CFCC for many features, thus the SYMBOL column may omit some pertinent features.

TIG-<county>.PAT Polygon Attribute Table

COLUMN	ITEM NAME	WIDTH	TYPE	DESCRIPTION
1	AREA	8	F	Area
9	PERIMETER	8	F	Perimeter
17	TIG-<county>#	4	B	System ID
21	TIG-<county>-ID	4	B	User ID
25	FP	4	B	FIPS Place Code
29	CTBNA90	6	C	Census Tract BNA #
35	BLK90	4	C	Tabulation Block #
39	ZIPCO	4	B	Zip Code
43	TOWN-ID	4	B	MassGIS Town-ID
**	REDEFINED ITEMS **			
17	LPOLY#	4	B	Alternate name system ID
17	RPOLY#	4	B	Alternate name system ID

TIG-<county>.003 Relates to .AAT based on User ID

COLUMN	ITEM NAME	WIDTH	TYPE	DESCRIPTION
1	TIG-<county>-ID	10	I	User ID
11	CTBNA80L	6	C	1980 Census Tract BNA # lf.
17	CTBNA80R	6	C	1980 Census Tract BNA # rt.
23	BLK80L	3	C	1980 Tabulation Block # lf.
26	BLK80R	3	C	1980 Tabulation Block # rt.

TIG-<county>.ACODE Relates to .AAT based on User ID

This is the entire attribute record for the entire county. Some features have more than one record due to 'alternate names'.

COLUMN	ITEM NAME	WIDTH	TYPE	DESCRIPTION
1	TIG-<county>-ID	4	B	User ID
5	RT	1	I	Record Type
6	VERSION	4	I	Version Number
10	RECNUM	10	I	Record Number Permanent
20	SIDE	1	I	Value 1 = data for only 1 side of segment
21	SOURCE	1	C	Source code
22	FDPRE	2	C	Feature direction prefix
24	FNAME	30	C	Feature Name
54	FTYPE	4	C	Feature Type
58	FDSUF	2	C	Feature direction suffix
60	CFCC	3	C	Census feature class code
63	LEFTADD1	11	C	Left address start #
74	LEFTADD2	11	C	Left address end #
85	RGTADD1	11	C	Right address start #
96	RGTADD2	11	C	Right address end #
107	LEFTFFL	1	I	From imputed address flag left.
108	LEFTTFL	1	I	To imputed address flag left.
109	RGTFFL	1	I	From imputed address flag right.
110	RGTTFL	1	I	From imputed address flag right.
111	ZIPCOLEF	5	I	Zip Code left
116	ZIPCORGT	5	I	Zip Code right
121	FAIR90L	5	I	FIPS Amer.Indian Reservation # left
126	FAIR90R	5	I	FIPS Amer.Indian Reservation # right
131	ANRC90L	2	I	Alaska native regional corp. code left
133	ANRC90R	2	I	Alaska native regional corp. code right
135	ST90LEFT	2	I	FIPS State code left
137	ST90RGT	2	I	FIPS State code right
139	CNT90LEFT	3	I	FIPS County code left
142	CNT90RGT	3	I	FIPS County code right

*** continued ***

145	FMCDCCD90L	5	I	FIPS Community Code left
150	FMCDCCD90R	5	I	FIPS Community Code right
155	FSUBMCD90L	5	I	FIPS Sub-MCD code left
160	FSUBMCD90R	5	I	FIPS Sub-MCD code right
165	FPLACO90L	5	I	FIPS Place code left
170	FPLACO90R	5	I	FIPS Place code right
175	CTBNA90L	6	C	Census tract BNA # left
181	CTBNA90R	6	C	Census tract BNA # right
187	BLK90L	4	C	Tabulation block # left
191	BLK90R	4	C	Tabulation block # right
195	FROMLONG	10	I	From longitude (6 decimal)
205	FROMLAT	9	I	From latitude (6 decimal)
214	TOLONG	10	I	To longitude (6 decimal)
224	TOLAT	9	I	To latitude (6 decimal)
	** REDEFINED ITEMS **			
22	NAME4	38	C	Feature direction prefix, feature name, feature direction suffix, feature type, concatenated together.

TIG-<county>.PLC **This is a small look-up-table that can be used to convert the FMCDCCD90L and FMCDCC90R items into the MassGIS TOWN-ID code. This file is only included with the COUNTY BASED TIGER data.**

COLUMN	ITEM NAME	WIDTH	TYPE	DESCRIPTION
1	TOWN-ID	4	B	MassGIS Town-ID Code
5	TOWN	21	C	Town Name
27	FMCDCCD90L	5	I	Census Place Code for the left. This ITEM has an alternate name: FMCDCCD90R so it can be used to de-code the right side too.

TIG-<town>.ADD **File created for Arc/INFO addressmatching. This file will only come with TOWN BASED TIGER coverages. This file is created by an Arc/INFO command and thus MassGIS does not have control over its format nor the accuracy of its records.**

COLUMN	ITEM NAME	WIDTH	TYPE	DESCRIPTION
1	ADDRESS	45	C	Address, similar to NAME4 from the .AAT
46	ZONE	15	C	Special ITEM to account for addresses that may appear in more than one town (or other geographic unit like zip code).
61	SIDE	1	C	Code denoting whether addresses are available on either or both sides of the arc.
62	PARITY	1	C	Code for whether address ranges are even or odd or mixed.
63	SOUNDEX	6	C	Item for using phonetic spelling.
69	TIG-56#	4	B	System ID
73	TIG-56-ID	4	B	User ID
	** REDEFINED ITEMS			
1	F-ADD	6	I	Subset of ADDRESS: from numbers.
8	T-ADD	6	I	Subset of ADDRESS: to numbers.
15	PRE.DIR	2	C	Subset of ADDRESS: direction prefix.
18	STREET.NAME	20	C	Subset of ADDRESS: Street Name
39	STREET.TYPE	4	C	Subset of ADDRESS: Street Type (Ave.,St.,etc.)
44	SUF.DIR	2	C	Subset of ADDRESS: direction suffix.

FUTURE ENHANCEMENTS

Currently, the TIGER files are composed of only the census geography. None of the summary data compiled during the 1990 Census is yet available. When these data are available (Census estimates end of March 1991), MassGIS intends to compile and package them with the MassGIS Arc/INFO TIGER files. Also available at the next release of TIGER will be additional columns of information which will allow users to extract the Massachusetts voter precincts.

It should be pointed out that TIGER releases each edition of the TIGER files as a complete package. Census announced the intention of compiling and correcting errors that were reported by 1990 Census Enumerators during the census taking. Thus, the topology of the line work of each TIGER release may be different. MassGIS will obtain the new TIGER files in their entirety and will re-process them as described above. The additional information content will also be newly processed.

FEE: $150 per county, or $150 per town

APPENDIX 1. Massachusetts Towns Which Have TIGER Address Ranges Available

Code for column PARTIAL?: 2 = Entire town available
1 = Part of town available

TOWN-ID	TOWN NAME	PARTIAL?	TOWN-ID	TOWN NAME	PARTIAL?
1	ABINGTON	2	5	AGAWAM	2
9	ANDOVER	2	10	ARLINGTON	2
17	AUBURN	2	26	BELMONT	2
30	BEVERLY	2	31	BILLERICA	2
35	BOSTON	2	40	BRAINTREE	2
46	BROOKLINE	2	49	CAMBRIDGE	2
56	CHELMSFORD	2	57	CHELSEA	2
61	CHICOPEE	2	70	DALTON	1
71	DANVERS	2	73	DEDHAM	2
79	DRACUT	2	85	EAST LONGMEADOW	2
93	EVERETT	2	95	FALL RIVER	2
97	FITCHBURG	2	100	FRAMINGHAM	2
110	GRAFTON	2	116	GROVELAND	2
123	HANSON	2	128	HAVERHILL	2
134	HOLDEN	1	137	HOLYOKE	2
145	KINGSTON	2	148	LANESBOROUGH	1
149	LAWRENCE	2	151	LEICESTER	1
152	LENOX	2	153	LEOMINSTER	2
155	LEXINGTON	2	159	LONGMEADOW	2
160	LOWELL	2	161	LUDLOW	2
162	LUNENBURG	1	163	LYNN	2
165	MALDEN	2	168	MARBLEHEAD	2
176	MEDFORD	2	178	MELROSE	2
180	MERRIMAC	2	181	METHUEN	2
186	MILLBURY	2	189	MILTON	2
196	NAHANT	2	198	NATICK	2
199	NEEDHAM	2	201	NEW BEDFORD	2
207	NEWTON	2	210	NORTH ANDOVER	2
220	NORWOOD	2	228	PAXTON	1
229	PEABODY	2	231	PEMBROKE	2
236	PITTSFIELD	2	243	QUINCY	2
248	REVERE	2	258	SALEM	2
262	SAUGUS	2	271	SHREWSBURY	2
273	SOMERSET	1	274	SOMERVILLE	2
281	SPRINGFIELD	2	284	STONEHAM	2
285	STOUGHTON	2	291	SWAMPSCOTT	2
292	SWANSEA	1	295	TEWKSBURY	2
305	WAKEFIELD	2	308	WALTHAM	2
314	WATERTOWN	2	317	WELLESLEY	2
321	WEST BOYLSTON	2	325	WEST SPRINGFIELD	2
329	WESTFIELD	2	333	WESTON	2
335	WESTWOOD	2	336	WEYMOUTH	2
344	WINCHESTER	2	346	WINTHROP	2
347	WOBURN	2	348	WORCESTER	2

APPENDIX 2: Additional Sources of TIGER and Arc/INFO Processing of TIGER Documentation

Census '90 Basics
U.S. Department of Commerce
Bureau of the Census
January 1990

Technical Documentation
TIGER/Line Precensus Files, 1990
U.S. Department of Commerce
Bureau of the Census
October 1989

Census ABC's
U.S. Department of Commerce
Bureau of the Census
September 1989

Census and You
Monthly News from the US Bureau of the Census
Monthly Newsletter

Strength In Numbers
U.S. Department of Commerce
Bureau of the Census
January 1990

TIGER Questions & Answers
U.S. Department of Commerce
Bureau of the Census
September 1990

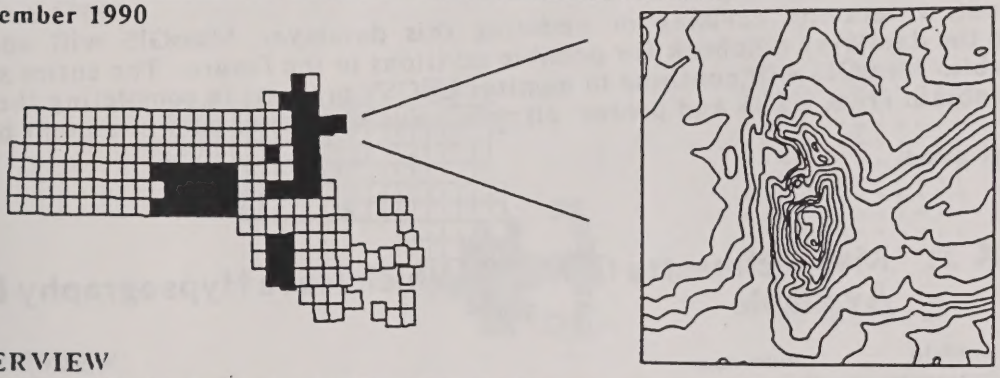
Arc/INFO Volume 2 Manual
ESRI
380 New York St.
Redlands, CA 92373
714-793-2853
January 1989

Converting TIGER/Line Files
ESRI
380 New York St.
Redlands, CA 92373
714-793-2853
January 1990

Bureau of the Census, Boston Office, Phone Number: 617-565-7078

HYPSOGRAPHY (Topographic Contours) Datalayer

MassGIS
Massachusetts Executive Office of Environmental Affairs
November 1990



OVERVIEW

The MassGIS obtained the USGS 1:25,000 Hypsography Digital Line Graph from the USGS National Mapping Division. These files were converted into ARC/INFO coverages and projected into the Massachusetts State Plane Coordinate System. The linework is excellent. All contour lines, at a 3 meter interval, appearing on the 1:25,000 USGS quadrangle sheets are included in these coverages. The data are stored as 189 individual quadrangle coverages named **HYPSO<QUAD-ID>**. The hypsography data are **NOT** available for the entire state. See Appendix 1 for a listing of quadrangles which have hypsography available.

ATTRIBUTES

Each coverage has had an item named **ELEV** added to the .AAT file. **ELEV** is filled with the elevation value of each contour line. Since the cartographic data base (x,y coordinates) is stored in feet, MassGIS converted the contour elevations (z coordinates) stored in **ELEV** from meters to feet. Because the published vertical accuracy of USGS topographic lines is +/-one contour interval (in excess of 9 ft.), MassGIS truncated the value stored in **ELEV** to an even foot. Further, all elevation values that were identified as negative numbers (positive elevation values with USGS MINOR codes of 205 or 206) were converted into actual negative numbers in **ELEV**.

Each coverage also has an ancillary INFO table called **HYPSO<quad-id>.ACODE** which can be related to .AAT file. This .ACODE file stores all of the original DLG coding. Included in this original coding is the elevation value of each line stored as meters. Each .ACODE file also contains several pairs of Major and Minor Items. The actual number of Major/Minor pairs varies from quad to quad. A **MAJOR-CODE = 24** signifies that the MINOR-CODE of that pair will contain the elevation value. The following is an example of what a typical .ACODE file might look like:

HYPSO<quad-id>-ID	Unique ID number for RELATING back to the .AAT file
MAJOR1	The USGS DLG Major Code
MINOR1	The USGS DLG Minor Code
MAJOR2	" "
MINOR2	" "
MAJOR3	" "
MINOR3	" "
MAJOR4	" "
MINOR4	" "
MAJOR5	" "
MINOR5	" "
majorN	" "
minorN	" "
ELEV	Contour line elevation stored in feet.

More information about the 1:25,000 DLG's including detailed descriptions of the Major/Minor code scheme can be found in the USGS National Mapping Division Publication, *Digital Line*

Graphs from 1:24,000-Scale Maps (Massachusetts is the only state which has quads produced using the metric system, and a 1:25,000 scale).

DATALAYER MAINTENENCE

MassGIS is **not**, at present, revising or updating this datalayer. MassGIS will add any corrections to the datalayer notebook for possible revisions in the future. The entire state is **not yet available**. MassGIS will continue to monitor USGS's progress in completing the state. MassGIS will obtain from USGS and process all newly available files on a bi-annual basis.

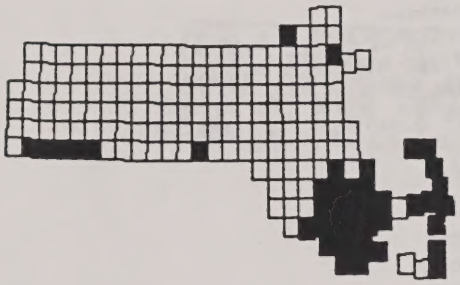
FEE: $100. per quad.

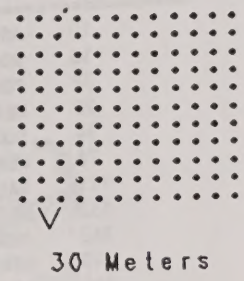
APPENDIX 1: Massachusetts QUADS Which Have Hypsography Data Available

Quad-ID	Quad Name
62	WARE
64	WALES
68	NORTH BROOKFIELD
69	EAST BROOKFIELD
70	SOUTHBRIDGE
74	PAXTON
75	LEICESTER
76	WEBSTER
80	WORCESTER NORTH
81	WORCESTER SOUTH
82	OXFORD
86	SHREWSBURY
87	GRAFTON
88	UXBRIDGE
92	MARLBOROUGH
93	MILFORD
94	BLACKSTONE
114	LEXINGTON
116	NORWOOD
119	SOMERSET
120	FALL RIVER
121	TIVERTON
122	HAVERHILL
127	BLUE HILLS
130	ASSONET
131	FALL RIVER EAST
132	WESTPORT
133	EXETER
134	NEWBURYPORT WEST
135	GEORGETOWN
136	SALEM
137	LYNN
138	HULL
139	WEYMOUTH
146	NEWBURYPORT EAST
147	IPSWICH
148	MARBLEHEAD NORTH
149	MARBLEHEAD SOUTH
150	NANTASKET BEACH
151	COHASSET
159	GLOUCESTER
168	ROCKPORT

USGS-NMD Digital Elevation Models (DEM's)

MassGIS
Massachusetts Executive Office of Environmental Affairs
March 1990





OVERVIEW

MassGIS has obtained two sets of grided elevation data from the USGS National Mapping Division. The first set is the **1:24,000 Digital Elevation Models**. These data are available in 7.5" x 7.5" blocks, however, they are NOT available on a statewide basis (see listing below). These data contain an elevation point every **30 meters** along the UTM grid. The second set of elevation data is the **USGS-NMD 1:250,000 Digital Elevation Models**. These data were originally produced by the Defence Mapping Agency and come in 1 degree x 1 degree blocks. These data contain an elevation point every **3 arc seconds** (in Massachusetts this equals approximately **200 feet along the East-West axis, and 300 feet along the North-South axis**). These less detailed data are available on a statewide basis.

PRODUCTION

These data have been altered minimally by MassGIS. The 1:24,000 Digital Elevation Models have been converted to **Arc/INFO Lattice Files.** These data remain in the UTM **projection and coordinate system,** and the elevations are stored as **meters.**

The 1:250,000 Digital Elevation Model data comes in an array that is larger than the Arc/INFO TIN v.5.01 can handle with the **DEMLATTICE** command. Consequently, MassGIS has developed the capability of cutting up the large DEM into smaller pieces. These pieces are then converted to **Arc/INFO Lattice Files.** These smaller pieces of data remain in the UTM **projection and coordinate system, and the elevations are stored as meters.** If you require a smaller piece of one of the 1:250,000 DEM's you should specify this in your order.

Further processing is required by the user to get the data into other projections, or other formats such as contours or TINs. Users should also note that the raw DEM files can be obtained directly from USGS.

More information about both types of DEM's can be found in the USGS National Mapping Division Publication, *Digital Elevation Models Data Users Guide.*

DATALAYER MAINTENANCE

MassGIS is not, at present, revising or updating this datalayer.

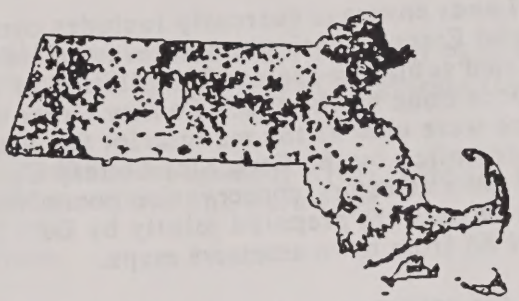
PRICE: $50. per lattice file.

Appendix 1: Massachusetts QUADs Which Have 1:24,000 DEM Data Available

Quad ID	Quad Name
10	ASHLEY FALLS
16	SOUTH SANDISFIELD
22	TOLLAND CENTER
28	WEST GRANVILLE
34	SOUTHWICK
76	WEBSTER
111	SALEM DEPOT
132	WESTPORT
142	ASSAWOMPSET POND
143	NEW BEDFORD NORTH
144	NEW BEDFORD SOUTH
145	CUTTYHUNK
147	IPSWICH
153	PLYMPTON
154	SNIPATUIT POND
155	MARION
156	SCONTICUT NECK
157	NAUSHON ISLAND
158	SQUIBNOCKET
163	WAREHAM
164	ONSET
165	WOODS HOLE
166	VINEYARD HAVEN
167	TISBURY GREAT POND
169	MANOMET
170	SAGAMORE
171	POCASSET
172	FALMOUTH
173	EDGARTOWN
174	SANDWICH
175	COTUIT
178	PROVINCETOWN
179	DENNIS
181	NORTH TRURO
182	WELLFLEET
183	ORLEANS
184	HARWICH
185	CHATHAM
186	MONOMOY POINT
187	GREAT POINT
188	SIASCONSET

PROTECTED OPEN SPACE Datalayer

MassGIS
Massachusetts Executive Office of Environmental Affairs, and
Department of Fisheries, Wildlife and Environmental Law Enforcement
March 1990



OVERVIEW

The Open Space Datalayer is a pair of 1:25,000 scale datalayers containing the boundaries of protected open space tracts in the Massachusetts. A general definition of "protected open space" is given below. A more precise definition is included in Appendix A.

Protected Open Space Definition:

> Land which is protected in perpetuity, either in fee or by deeded restriction, by any federal, state, county, local, or private group for the purposes of conservation, habitat protection, or recreation.

The Protected Open Space data are organized into two complimentary coverages. The **State & Federal Lands** coverage includes open space owned by state and federal agencies, and three private non-profit organizations: The Trustees of Reservations (TTOR), the Massachusetts Audubon Society (MAS), and The Nature Conservancy (TNC). The compilation of the State & Federal Lands coverage was begun in March 1988 and completed in July, 1988. The data on state-owned open space holdings will be updated ona a regular basis.

The **Community and Local Lands** coverage depicts open space owned by communities or private non-profit organizations, including the numerous local land trusts. This coverage is still in development, and currently provides data for Berkshire and Essex Counties, and the Nashua River Basin.

SOURCE MANUSCRIPTS

The **State & Federal Lands** coverage was compiled in 1988 from 1:25,000 scale USGS maps maintained by each of the agencies of EOEA: the Dept. of Environmental Management (DEM), the Dept. of Fisheries, Wildlife and Environmental Law Enforcement (DFWELE), the Metropolitan District Commission (MDC), the Dept. of Food and Agriculture (DFA), the Dept. of Environmental Protection, DEP), and the Massachusetts Audubon Society (MAS).

The agencies maintain their own maps and standards. The accuracy of these maps varies. Some of the parcels have been compiled onto USGS quadrangles from detailed surveys, while in other cases the exact property boundary is not known. The compilation process that produced a unified manuscript faithfully reproduced the property boundaries as represented on the agencies' maps. The data are useful for most statewide and regional planning purposes. However, this State & Federal Lands coverage is not a legal record of ownership, and the user should understand that the parcel representations are not often based on property surveys.

PRODUCTION

The DFWELE cartographer compiled onto this manuscript the land holdings of the National Park Service (NPS), US Fish & Wildlife Service (USFWS), and The Trustees of

Reservations (TTOR, incomplete). Updating of this coverage began in the fall of 1989, and it is expected that updates to the geographic and attribute databases will be frequent. The technical protocol for updating the open space datalayer is currently being developed by MassGIS, and data capture policy and procedures are being developed by EOEA.

The **Community and Local Lands** coverage currently includes community and non-profit holdings within Berkshire and Essex Counties and within the Nashua River basin. The production methodology varied subtly by region. Compilation of open space holdings in Essex County had already been done by the Essex County Greenbelt Association (ECGA), and these 1:25,000 scale maps were used as the manuscript for Essex County. Manuscripts for Berkshire County were compiled by the Berkshire County Cooperative Extension Service in cooperation with town assessors, conservation commissions, and local land trusts. Manuscripts for the Nashua Basin were prepared jointly by DFWELE and the Department of Food and Agriculture (DFA) from town assessors maps.

All manuscripts for each of the coverages were reviewed by DFWELE. The manuscripts were then digitized by the Department of Regional Planning and Landscape Architecture, University of Massachusetts at Amherst. Checkplots were produced and reviewed by the DFWELE cartographer for precision. A digital database was prepared by DFWELE with a record for each polygon in the coverage. the database contains records of ownership, management responsibility, and the facility name. This database is distinct from the coverage, but can be used in conjunction with the Arc/INFO coverage.

ATTRIBUTES

Several **Items** were added to the open space polygon attribute table (in Arc/INFO):

OS-ID	the unique five digit ID code indicating ownership type,
SCORP-ID	a six digit code reference or primary key to the facility record in the Statewide Open Space and Recreation Plan facility database.
P-UNIT	a one character code indicating ownership by major political unit,
AGENCY	a ten character code indicating ownership by agency or organization,
TYPE	a one digit code indicating whether the polygon is the "master polygon," an adjacent acquisition under the same ownership, or a disjoint parcel.

P-UNIT		AGENCY	TYPE	
F	Federal	see Appendix B.	M	Master or main polygon (1 per facility)
S	State		A	polygon Adjacent to the main polygon
T	Town or City		D	Disjoint polygon, an "island"
P	Private non-profit			
I	Inholding			

CHECKPLOT & EDITING

A full set of plots was made at a scale of 1:25,000. Edits were made as needed.

PANELS

When complete, each of the 2 statewide datalayers will be composed of 6 panels. At present the paneling scheme is in transition. Contact MassGIS for more information.

DATALAYER MAINTENANCE

A datalayer notebook is being maintained by the MassGIS. Any updates or corrections sent to MassGIS will be recorded, and datalayer modifications will be made as required.

APPENDIX A

The scope of the protected open space datalayer does not include all publicly owned lands. INCLUDED under this definition and eligible for inclusion in the open space datalayer:

Federal:
National Seashore, National Historic Sites, other National Park Service facilities, US Fish & Wildlife Service Sanctuaries, US Army Corps of Engineers flood control properties.

State:
State Parks, State Forests, Wildlife Management Areas, Wildlife Sanctuaries, Agricultural Preservation Restrictions, Reservations and Parkways.

County: County Reservations

Municipal:
Conservation Commission lands, aquifer lands protected in fee or by Conservation Restriction, watershed protection lands, town forests, fire districts, scenic roads, town commons, parkways, and trails.

Non-profit Land Conservation Organizations:
Mass. Audubon Society, The Trustees of Reservations, and The Nature Conservancy lands, and other Land Trust lands.

EXCLUDED from this datalayer:

Military reservations and bases
Hospitals
Cemeteries- Unless recognized by the community as a conservation resource (e.g., Mount Auburn Cemetery, Cambridge).
Airports
Schools, Ballparks & Playgrounds
Private Fish and Game Clubs
Private Recreational Areas- golf courses, campgrounds, ski areas and scout camps)
Municipal Facilities- police & fire stations, town hall, town garages.

APPENDIX B

OPEN SPACE ID NUMBER RANGES

Agency	Range	Agency Code
STATE	0 - 39999	
DEM	0 - 4999	DEM
DEP	5000 - 5999	DEP
DFA	6000 - 6999	DFA
DFWELE	7000 - 9999	DFWELE
EOEA	10000 - 10999	EOEA
MDC	11000 - 13999	MDC
DPW	14000 - 14999	DPW
U. MASS	15000 - 15009	U MASS
MISC. STATE	15010 - 16999	

FEDERAL	**40000 - 44999**	
US F&W Service	40000 - 40999	USFWS
US Forest Service	41000 - 41999	USFS
National Park Service	42000 - 42999	NPS
Army Corps of Engin.	43000 - 43999	ACOE
General Services Adm.	44000 - 44019	GSA
MISC. FEDERAL	44020 - 44999	
PRIVATE NON-PROFIT	**45000 - 49999**	
Mass. Audubon Society	45000 - 46499	MAS
The Nature Conservancy	46500 - 46599	TNC
Nashoba Conservation Trust	46600 - 46619	Nash C T
Groton Conservation Trust	46620 - 46629	Grot C T
White Oak LCS	46630 - 46639	WOLCS
Fruitlands Museum	46640 - 46649	Frui M
Bromfield Trustees	46650 - 46659	Brom T
Forbush Bird Club	46660 - 46669	Forb B C
Heiffer Project Intn'l	46670 - 46679	HPI
Valley Farms Wildlife Sanc.	46680 - 46689	VFWS
The Trustees of Reservations	47000 - 47499	TTOR
Essex Co. Greenbelt Assoc.	49000 - 49099	
Andover VIS	49100 - 49149	AVIS
Essex Trust	49150 - 49199	
FPW	49200 - 49219	
Rockport VIS	49220 - 24249	
RSPCA	49250 - 49259	
Merrimack I. Soc.	49260 - 49269	
Manchester Trust	49300 - 49319	
Worcester Horticult. Soc.	49320 - 49349	WHS
Bolton Conserv. Trust	49350 - 49379	Bolt C T
Harvard Conserv. Trust	49380 - 49399	Harv C T
Berkshire Co. Land Trust	49400 - 49499	BCLT
Sudbury Valley Trustees	49500 - 49599	SVT
New England Forestry Found.	49600 - 49649	NEFF
Williamstown Rural L T	49650 - 49699	
Appalachian Mtn. Club	49700 - 49749	AMC
Appalachian Trail Confer.	49750 - 49799	
Laurel Hill Soc.	49800 - 49849	
Monterey Land Trust	49850 - 49874	
The Mount	49875 - 49879	
Natnl Trust for Hist. Pres.	49880 - 49889	
Stockbridge Bowl	49890 - 49899	
New Marlborough L T	49900 - 49924	
Shaker Village	49925 - 49949	
Stockbridge L T	49950 - 49999	
TOWN OWNED OPEN SPACE	**50000 - 85099**	
COUNTY LANDS	**85100 -85799**	
MISCELLANEOUS	**86000 - 99999**	
(non-state non-federal)		
INHOLDINGS	**-77777**	

FEE: $100. per panel.

TERMS AND CONDITIONS CONCERNING THE USE OF DIGITAL DATA PROVIDED BY THE MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS

This Agreement specifies the terms and conditions under which digital data and/or digital data products provided by the *Massachusetts Executive Office of Environmental Affairs* (herein EOEA), located at 100 Cambridge Street, Suite 2000, Boston, MA 02202, may be used.

AUTHORITY

The legal authority for EOEA to recover and retain fees for the distribution of data under the terms of this Purchase Agreement is *G.L.M. Chapter 240, Section 2C, line 2001-1001 of the Acts of 1989* wherein EOEA is authorized to render "data processing services to state agencies, authorities and units of government within the Commonwealth" and to distribute "digital cartographic and other data".

The fee schedule for the distribution of digital data and digital data products is established in *Chapter 653, section 138, of the 'Budget Control and Reform Act of 1989'.*

JUSTIFICATION AND PURPOSE

EOEA administers, supervises and/or funds a variety of regulatory and management programs that are important to the environmental resources of the Commonwealth. EOEA and its agencies manage the Environmnetal Affairs Data Center, the MassGIS and several other environmental information system units which support their information management needs. It is the policy of EOEA to provide to its agencies, and other agencies, authorities and units of government and the private sector within the Commonwealth access to data and data processing services which will enhance the quality of environmental regulatory, mangement and resource decisions. It is the expressed intent of the General Court that EOEA should recover some of the costs associated with the provision of data and data processing services.

USE OF DATA PROVIDED UNDER THIS AGREEMENT

Data provided under this Agreement are intended for the sole use of the purchasing agency, organization or individual. They are **not** to be distributed or resold to other agencies, organizations or individuals without the prior expressed, written consent of EOEA. Data may be enhanced, analyzed, manipulated or output by the duly authorized agents of the purchasing agency or organization but ***only*** for the ***purposes*** of the purchasing agency or organization.

All maps or other documents produced using data or data products supplied through this agreement must contain a data source credit, prominently displayed, such as "source data supplied by the Massachusetts Executive Office of Environmental Affairs, MassGIS."

EOEA requires that in the use of these data that the purchasing agency, organization or individual employ, attach or release a statement which includes the following.

"These digital data represent the efforts of the Massachusetts Executive Office of Environmental Affairs and its agencies to record information from the cited source materials. EOEA maintains an ongoing program to record and correct errors in these data that are brought to its attention. EOEA makes no claims as to the validity or reliability or to any implied uses of these data. EOEA maintains records regarding all methods used to collect and process these digital data and will disclose this information upon request."*

* Examine the documentation file for a description of the source material.

PURCHASE ORDER
FOR DIGITAL DATA OR SERVICES
TO BE PROVIDED BY
THE MASSACHUSETTS EXECUTIVE OFFICE
OF ENVIRONMENTAL AFFAIRS

Name of Purchasing Agency: _____

Organization or Individual: _____

Contact Person Regarding
Details of This Order: _____

Address: _____

Phone Number: _____

I, (we), would like to purchase the following digital products or services from EOEA (list coverages or plots singly, using naming conventions in Data Layer Descriptions if available.)

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

I, (we), acknowledge that submission of this order binds us to the terms and conditions of the agreement concerning use and distribution of this data which we have read and understand.

signed: _____

date: _____

Please enclose a check, payable to Executive Office of Environmental Affairs, Account # 2001-1001, or a purchase order from your organization. Send to:

MassGIS c/o EOEA Data Center
20 Somerset St. 3rd floor
Boston MA 02108

If there are any questions about this order, call MassGIS at 727-3888.

Massachusetts Quad Numbers and Corresponding Names

1 CANAAN
2 STATE LINE
3 EGREMONT
4 BASHBISH FALLS
5 BERLIN
6 HANCOCK
7 PITTSFIELD WEST
8 STOCKBRIDGE
9 GREAT BARRINGTON
10 ASHLEY FALLS
11 WILLIAMSTOWN
12 CHESHIRE
13 PITTSFIELD EAST
14 EAST LEE
15 MONTEREY
16 SOUTH SANDISFIELD
17 NORTH ADAMS
18 WINDSOR
19 PERU
20 BECKET
21 OTIS
22 TOLLAND CENTER
23 ROWE
24 PLAINFIELD
25 WORTHINGTON
26 CHESTER
27 BLANDFORD
28 WEST GRANVILLE
29 HEATH
30 ASHFIELD
31 GOSHEN
32 WESTHAMPTON
33 WORONOCO
34 SOUTHWICK
35 COLRAIN
36 SHELBURNE FALLS
37 WILLIAMSBURG
38 EASTHAMPTON
39 MOUNT TOM
40 WEST SPRINGFIELD
41 BERNARDSTON
42 GREENFIELD
43 MT TOBY
44 MT HOLYOKE
45 SPRINGFIELD NORTH
46 SPRINGFIELD SOUTH
47 NORTHFIELD
48 MILLERS FALLS
49 SHUTESBURY
50 BELCHERTOWN
51 LUDLOW
52 HAMPDEN
53 MT GRACE
54 ORANGE
55 QUABBIN RESERVOIR
56 WINSOR DAM
57 PALMER
58 MONSON
59 ROYALSTON
60 ATHOL
61 PETERSHAM
62 WARE
63 WARREN
64 WALES
65 WINCHENDON
66 TEMPLETON
67 BARRE
68 NORTH BROOKFIELD
69 EAST BROOKFIELD
70 SOUTHBRIDGE
71 ASHBURNHAM
72 GARDNER
73 WACHUSETT MTN
74 PAXTON
75 LEICESTER
76 WEBSTER
77 ASHBY
78 FITCHBURG
79 STERLING
80 WORCESTER NORTH
81 WORCESTER SOUTH
82 OXFORD
83 TOWNSEND
84 SHIRLEY
85 CLINTON
86 SHREWSBURY
87 GRAFTON
88 UXBRIDGE
89 PEPPERELL
90 AYER
91 HUDSON
92 MARLBOROUGH
93 MILFORD
94 BLACKSTONE
95 NASHUA SOUTH
96 WESTFORD
97 MAYNARD
98 FRAMINGHAM
99 HOLLISTON
100 FRANKLIN
101 PAWTUCKET
102 LOWELL
103 BILLERICA
104 CONCORD
105 NATICK
106 MEDFIELD
107 WRENTHAM
108 ATTLEBORO
109 EAST PROVIDENCE
110 BRISTOL
111 SALEM DEPOT
112 LAWRENCE
113 WILMINGTON
114 LEXINGTON
115 NEWTON
116 NORWOOD
117 MANSFIELD
118 NORTON
119 SOMERSET
120 FALL RIVER
121 TIVERTON
122 HAVERHILL
123 SOUTH GROVELAND
124 READING
125 BOSTON NORTH
126 BOSTON SOUTH
127 BLUE HILLS
128 BROCKTON
129 TAUNTON
130 ASSONET
131 FALL RIVER EAST
132 WESTPORT
133 EXETER
134 NEWBURYPORT WEST
135 GEORGETOWN
136 SALEM
137 LYNN
138 HULL
139 WEYMOUTH
140 WHITMAN
141 BRIDGEWATER
142 ASSAWOMPSET POND
143 NEW BEDFORD NORTH
144 NEW BEDFORD SOUTH
145 CUTTYHUNK
146 NEWBURYPORT EAST
147 IPSWICH
148 MARBLEHEAD NORTH
149 MARBLEHEAD SOUTH
150 NANTASKET BEACH
151 COHASSET
152 HANOVER
153 PLYMPTON
154 SNIPATUIT POND
155 MARION
156 SCONTICUT NECK
157 NAUSHON ISLAND
158 SQUIBNOCKET
159 GLOUCESTER
160 SCITUATE
161 DUXBURY
162 PLYMOUTH
163 WAREHAM
164 ONSET
165 WOODS HOLE
166 VINEYARD HAVEN
167 TISBURY GREAT POND
168 ROCKPORT
169 MANOMET
170 SAGAMORE
171 POCASSET
172 FALMOUTH
173 EDGARTOWN
174 SANDWICH
175 COTUIT
176 HYANNIS
177 TUCKERNUCK ISLAND
178 PROVINCETOWN
179 DENNIS
180 NANTUCKET
181 NORTH TRURO
182 WELLFLEET
183 ORLEANS
184 HARWICH
185 CHATHAM
186 MONOMOY POINT
187 GREAT POINT
188 SIASCONSET
189 HAMPTON

MASSACHUSETTS COMMUNITY CODES

1. Abington
2. Acton
3. Acushnet
4. Adams
5. Agawam
6. Alford
7. Amesbury
8. Amherst
9. Andover
10. Arlington
11. Ashburnham
12. Ashby
13. Ashfield
14. Ashland
15. Athol
16. Attleboro
17. Auburn
18. Avon
19. Ayer
20. Barnstable
21. Barre
22. Becket
23. Bedford
24. Belchertown
25. Bellingham
26. Belmont
27. Berkley
28. Berlin
29. Bernardston
30. Beverly
31. Billerica
32. Blackstone
33. Blandford
34. Bolton
35. Boston
36. Bourne
37. Boxborough
38. Boxford
39. Boylston
40. Braintree
41. Brewster
42. Bridgewater
43. Brimfield
44. Brockton
45. Brookfield
46. Brookline
47. Buckland
48. Burlington
49. Cambridge
50. Canton
51. Carlisle
52. Carver
53. Charlemont
54. Charlton
55. Chatham
56. Chelmsford
57. Chelsea
58. Cheshire
59. Chester
60. Chesterfield
61. Chicopee
62. Chilmark
63. Clarksbury
64. Clinton
65. Cohasset
66. Colrain
67. Concord
68. Conway
69. Cummington
70. Dalton
71. Danvers
72. Dartmouth
73. Dedham
74. Deerfield
75. Dennis
76. Dighton
77. Douglas
78. Dover
79. Dracut
80. Dudley
81. Dunstable
82. Duxbury
83. East Bridgewater
84. East Brookfield
85. East Longmeadow
86. Eastham
87. Easthampton
88. Easton
89. Edgartown
90. Egremont
91. Erving
92. Essex
93. Everett
94. Fairhaven
95. Fall River
96. Falmouth
97. Fitchburg
98. Florida
99. Foxborough
100. Framingham
101. Franklin
102. Freetown
103. Gardner
104. Gayhead
105. Georgetown
106. Gill
107. Gloucester
108. Goshen
109. Gosnold
110. Grafton
111. Granby
112. Granville
113. Gt. Barrington
114. Greenfield
115. Groton
116. Groveland
117. Hadley
118. Halifax
119. Hamilton
120. Hampden
121. Hancock
122. Hanover
123. Hanson
124. Hardwick
125. Harvard
126. Harwich
127. Hatfield
128. Haverhill
129. Hawley
130. Heath
131. Hingham
132. Hinsdale
133. Holbrook
134. Holden
135. Holland
136. Holliston
137. Holyoke
138. Hopedale
139. Hopkington
140. Hubbardston
141. Hudson
142. Hull
143. Huntington
144. Ipswich
145. Kingston
146. Lakeville
147. Lancaster
148. Lanesborough
149. Lawrence
150. Lee
151. Leicester
152. Lenox
153. Leominister
154. Leverett
155. Lexington
156. Leydon
157. Lincoln
158. Littleton
159. Longmeadow
160. Lowell
161. Ludlow
162. Lunenbury
163. Lynn
164. Lynnfield
165. Malden
166. Manchester
167. Mansfield
168. Marblehead
169. Marion
170. Marlborough
171. Marshfield
172. Mashpee
173. Mattapoisett
174. Maynard
175. Medfield
176. Medford
177. Medway
178. Melrose
179. Mendon
180. Merrimac
181. Methuen
182. Middleborough
183. Middlefield
184. Middleton
185. Milford
186. Millbury
187. Millis
188. Millville
189. Milton
190. Monroe
191. Monson
192. Montague
193. Monterey
194. Montgomery
195. Mount Washington
196. Nahant
197. Nantucket
198. Natick
199. Needham
200. New Ashford

MASSACHUSETTS COMMUNITY CODES

201. New Bedford
202. New Braintree
203. New Marlborough
204. New Salem
205. Newbury
206. Newburyport
207. Newton
208. Norfolk
209. North Adams
210. North Andover
211. North Attleborough
212. North Brookfield
213. North Reading
214. Northampton
215. Northborough
216. Northbridge
217. Northfield
218. Norton
219. Norwell
220. Norwood
221. Oak Bluffs
222. Oakham
223. Orange
224. Orleans
225. Otis
226. Oxford
227. Palmer
228. Paxton
229. Peabody
230. Pelham
231. Pembroke
232. Pepperell
233. Peru
234. Petersham
235. Phillipston
236. Pittsfield
237. Plainfield
238. Plainville
239. Plymouth
240. Plympton
241. Princeton
242. Provincetown
243. Quincy
244. Randolph
245. Raynham
246. Reading
247. Rehoboth
248. Revere
249. Richmond
250. Rochester
251. Rockland
252. Rockport
253. Rowe
254. Rowley
255. Royalston
256. Russell
257. Rutland
258. Salem
259. Salisbury
260. Sandisfield
261. Sandwich
262. Saugus
263. Savoy
264. Scituate
265. Seekonk
266. Sharon
267. Sheffield
268. Shelburne
269. Sherborn
270. Shirley
271. Shrewsbury
272. Shutesbury
273. Somerset
274. Somerville
275. South Hadley
276. Southampton
277. Southboro
278. Southbridge
279. Southwick
280. Spencer
281. Springfield
282. Sterling
283. Stockbridge
284. Stoneham
285. Stoughton
286. Stow
287. Sturbridge
288. Sudbury
289. Sunderland
290. Sutton
291. Swampscott
292. Swansea
293. Taunton
294. Templeton
295. Tewksbury
296. Tisbury
297. Tolland
298. Topsfield
299. Townsend
300. Truro
301. Tyngsborough
302. Tyringham
303. Upton
304. Uxbridge
305. Wakefield
306. Wales
307. Walpole
308. Waltham
309. Ware
310. Wareham
311. Warren
312. Warwick
313. Washington
314. Watertown
315. Wayland
316. Webster
317. Wellesley
318. Wellfleet
319. Wendell
320. Wenham
321. West Boylston
322. West Bridgewater
323. West Brookfield
324. West Newbury
325. West Springfield
326. West Stockbridge
327. West Tisbury
328. Westborough
329. Westfield
330. Westford
331. Westhampton
332. Westminister
333. Weston
334. Westport
335. Westwood
336. Weymouth
337. Whately
338. Whitman
339. Wilbraham
340. Williamsburg
341. Williamstown
342. Wilmington
343. Winchendon
344. Winchester
345. Windsor
346. Winthrop
347. Woburn
348. Worcester
349. Worthington
350. Wrentham
351. Yarmouth